THE AMERICAN GAS LIGHT JOURNAL

REDMANRKENRY.N.Y

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE

VOLUME LXXVIII. No. 9. Whole No. 1,447. | NEW YORK, MONDAY, MARCH 2, 1903. | $3 PER ANNUM. IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICES—

Nineteenth Annual Meeting, Ohio Gas Light Association..... 321

Wrinkle Department, Western Gas Association..... 321

EDITORIALS—

Briefly Told..... 321

The New England Association's Annual Dinner.

Thirty third Annual Meeting of the New England Association of Gas Engineers—Official Report—Revised by the Secretary..... 322

First Day, Morning Session—Report of the Board of Directors—Additions to and Changes in Membership—Election of New Members—Inaugural Address.

Abstract of the Proceedings of the Tenth Annual Meeting, Michigan Gas Association..... 324

Report of Executive Committee—Election of New Members—Appointment of Committees—First Day, Afternoon Session—Roll Call—A Brace of Invitations—Second Day, Morning Session—Report of Committee on Scholarship—Report of Committee on Nominations—Election of Officers—Report of Committee on President's Address—Report of Committee on Resolutions—Report of Committee on Next Place of Meeting—Vote of Thanks.

Four Months' Experience with Gas Engines, by Mr. Geo. MacMillan 326

*Ammonia Concentration at Gas Works, by Mr. John S. Unger 327

Some Electrical Fire Hazards, by Mr. W. Devereux..... 328

A Few Photometric Tests of Incandescent Mantles in Commercial Use, by Mr. R. C. Cornish..... 330

SPECIAL ENGLISH CORRESPONDENCE..... 330

Inclined Retorts and the Quality of Coal—The Accounts for the Last Half Year—The Inverted Gas Light.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 332

Mr Lea Goes to Fort Wayne, Ind.—Changes in Laclede Share Values—Revised Gas Rates, Wakefield, Mass—Annual Meeting, Salem, Mass.—A Poughkeepsie Bill—Sale of the Natchez (Miss.) Gas and Electric Plants—A "Strike"—Annual Meeting, Kalamazoo, Mich.—A Hint from Minneapolis, Minn.—Something from St. Paul, Minn.—Manager Pettibone's Report—Death of Mr. Wm. H. Ward—Cheaper Gas for Rockford, Ills.—Public Lighting Contract, Newark, N. J.—And Other Items.

Recent Patents of Interest to Gas Men..... 333

The Market for Gas Securities..... 334

[OFFICIAL NOTICE.]

Nineteenth Annual Meeting, Ohio Gas Light Association.

OHIO GAS LIGHT ASSOCIATION,
OFFICE OF THE SECRETARY,
DELAWARE, O., Feb. 20, 1903.

The Nineteenth Annual Meeting of the Ohio Gas Light Association will be held at Cincinnati, O., March 18th, 19th and 20th, 1903.

The President, Mr. C. W. Andrews, of Hamilton, O., will call the meeting to order on Wednesday, March 18th, at 9:30 A.M., in convention hall at the Grand Hotel, the headquarters.

The Executive Committee have again made a radical departure in their programme, in that a Question Box Editor has been appointed, in the person of Mr. Henry L. Doherty. Written questions have been asked and answers returned, and this department will undoubtedly be one of the most interesting features of the meeting.

The following papers will be presented:

"Domestic Heating by Gas," by Mr. Donald McDonald, Louisville, Ky.

"Natural Gas as a Factor in the Artificial Business," by Mr. F. W. Stone, Ashtabula, O.

"Construction and Operation of Gas Benches," by Mr. W. A. Baehr, Denver, Col.

"Progress Department," edited by Mr. Irvin Butterworth, Denver, Col.

"Wrinkle Department," edited by Mr. E. E. Eysenbach, St. Paul, Minn.

"Novelty Advertising Department," edited by Mr. B. W. Perkins, South Bend, Ind.

An opportunity will be given any of the speakers at the meeting to correct their remarks before leaving Cincinnati, but not after, as all reports will be turned over to the printer immediately after the adjournment of the meeting.

On Wednesday evening, March 18th, the Association will be the guests of the Cincinnati Gas and Electric Company at a theater. On Thursday, March 19th, the Convention will be the guests of the Hamilton-Otto Coke Oven Company. A special train will leave Cincinnati, at 12:20, on a trip to inspect the coke ovens at Hamilton. The members will be entertained at luncheon at the F. & L. Kahn & Bros. new stove factory. Returning from Hamilton the train will arrive in Cincinnati about 6 o'clock. In the evening the Association will be the guests of the Stacey Manufacturing Company and the United States Cast Iron Pipe and Foundry Company at dinner.

The Grand is conducted on the American and European plans, and the following rates have been secured for the meeting: American plan—$3 to $10 a day. European plan—$1.50 to $7 a day. The Grand hopes to entertain all of the Association, and will put forth every effort to make the members comfortable. The most satisfactory quarters are always obtained by writing in advance to the hotel people.

The Secretary will furnish application blanks for membership, and any further information which may be desired relative to the meeting.

T. C. JONES, Secretary.

[OFFICIAL NOTICE.]

Wrinkle Department, Western Gas Association.

WESTERN GAS ASSOCIATION,
OFFICE OF THE WRINKLE DEPARTMENT,
721 Citizens Building, Cleveland, O.

To the Members of the Western Gas Association: The Wrinkle Department is now ready to receive contributions for the 1903 collection, and I would thank you to please send a sketch or description of any new device or method you may have to the above address.

Any sketch, photograph or drawing, accompanied by a written explanation, of a new idea will be gratefully received, and it is hoped that you will comply promptly by favoring us with a contribution.

Respectfully,
W. E. STEINWEDELL,
Editor Wrinkle Department.

BRIEFLY TOLD.

THE NEW ENGLAND ASSOCIATION'S ANNUAL DINNER.—"I thought you might like some account of that which was 'done, seen and heard' at the dinner in Young's, which was such an enjoyable feature of the thirty-third (mystic number) assembling of the New England Association of Gas Engineers, whose members and guests to the number of 120 heartily participated therein. It is certainly safe to say that all enjoyed the initial number of the evening's programme, the main point therein being the consuming of Host Whipple's excellent cheer, the absorbing of the viands being aided greatly by excellent music 'between courses.' In fact, the strains were enlivening to the point that the diners occasionally joined in the choruses that go so well with some of the popular airs.

MAR 2 1903
SMITHSONIAN DEPOSIT

At the withdrawing of the cloth, President and Toastmaster McKay, in assuming the 'high seat,' made a neat opening speech, in the course of which he quoted a few lines from the closing address of the Association's third President—the late Samuel G. Stiness—as illustrative of his (Mr. McKay's) current thought: 'I rejoice with you in what the past has brought to us of honor or achievement, and what the future promises of success or advancement, hoping that peace and harmony may ever exist in the Association, and that we shall plan and act for the good of all.' Mr. McKay then called upon Mr. Forrest E. Barker, Chairman of the State Board of Gas and Electric Light Commissioners, to respond to the toast of 'The Commonwealth.' In his remarks the Commissioner referred to the excellent work done in the State as to the inspection of gas and meters under the new authorities, and considered the service an improvement, inasmuch as the number of candle power and sulphur tests calling for fines had virtually increased, and his listeners appreciated his remarks in connection with the fact that there were not more fines recorded, crediting Mr. C. D. Lamson in proportion therefor—it was matter for great regret that Mr. Lamson's illness prevented him from attending the dinner. The Commissioner spoke at length upon the development of the gas and electric lighting business, and referred to the present as being an era of consolidation, the result of which to his thought was still in doubt. He expressed his appreciation of the courtesy shown to him by the Association and its members, and thanked them for their intelligent co-operation in their interpretation of the laws which bound them as interdependents for the public good. Mr. Walter Badger, counsel for the Boston Gas Light Company, was the next speaker. He said he was 'glad' to be present, in that the dinner was good and that he was ever pleased to listen to the truth as expounded by President McKay; but such pleasure should be mutual, for were not both members of the same Company. Mr. Badger referred to the responsibility an attorney shoulders, gave an example of his thoughts anent trusts, and gave his listeners to understand that one reason which gave him pride in his profession was there was no 'Trust in it!' Mr. A. E. Forstall, Secretary of the American Gas Light Association, responding to Mr. McKay's request that he should say something in regard to the work of that Association, said he was in the main present to see how the meetings of the New England Association were conducted; and after a few side narratives, coupled with apologies for his lack of ability in retailing such narratives, he referred to the work of the members of the Association as individuals. He said that during his six years of experience as Secretary of the American Association, and as an inducer of papers during that period, there were just two papers contributed voluntarily and that 5 per cent. of the members did the work for the entire Association. Mr. William McDonald, of Albany, N. Y., ex-President of the Western Gas Association, then contributed some well pointed and pleasing remarks, put out in his genial, whole-souled way, as to the mutual enjoyment of those who were assisting the 33d hospitable reunion of the Mother Association. He was especially pleased to know that the revenue of the State of Massachusetts had been increased through the 'meter man.' He expressed again his pleasure in being with the Association, and remarked that, whereas he was a 'great man' in the Western Association, he felt he was only 'one of the boys' when under the roof of the New Englanders. With some very fitting remarks and hearty expression of good wishes of the Association to Mr. Walter R. Addicks, who was recently elected First Vice-President of the great Consolidated Gas Company, of New York, President McKay asked that gentleman to respond. With words full of feeling and sincerity Mr. Addicks convinced us all of the sorrow that he felt over leaving his home in Brookline and his co-workers in Boston, and in connection therewith named Messrs. Wood, McKay, Wing and Spear for their fealty in all things and for the loyal support he received from them. To add seasoning to his Boston career, he remembered his generous enemies, Gould and Allyn. He also gave utterance to his regret at parting with those who meet under the 'Golden Dome,' but feels that he now can take a free breath without reporting to a commission. It is as great a satisfaction to the Association as it is to Mr. Addicks that he feels equally at home with those who belong to the 'water brigade' as with those who don't. Mr. Addicks closed his remarks with a toast to 'The New England Association, God Bless Her!' and the toast put away, all joined in the 'Soldier's Farewell.' Mr. C. F. Prichard responded to the President's call on his 21st anniversary of membership in the Association. He recited some of the past experiences at the meetings and repeated some of the stories told in the old days. He spoke of the expansion and future of the gas industry, recalled the ancient remark that the money in the gas business was made in the retort house, and suggested that it be changed so as to read in Wall Street. 'Whereas we do the work, we have those in Wall Street watching us for results,' he said. Mr. Prichard named over some of those given to the industry from New England, and as the Association's best gift he was proud to name Walter R. Addicks, and suggested that any of us might be willing to join the 'water brigade' if its charge would bring one to the rampart of a vice-President of the Consolidated Company, of New York. Mr. F. H. Shelton was then prevailed upon to make a 'few remarks,' and whether he 'fell down and broke his English in Paris' or not, he illustrated well to those present that the wound had so well healed that no trace of the accident remained. He said he came to New England, in 1887, to 'do' the people at Lewiston, but had not made this trip to 'do anyone or anything' especially. He had always tried to do the best he could for the success of the meeting, and followed along in racy vein; one sally that caused much laughter being to the effect that he might need a plumber to mend the leaks in his speech. His presentation to Mr. McKay of a gas range emblem brought the evening's enjoyment to a close, and in satisfied, contented frame of mind, we left the banquet hall to the strain of 'Auld Lang Syne.—P."

[Official Report—Revised by the Secretary.]

THIRTY-THIRD ANNUAL MEETING OF THE NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Held in Young's Hotel, Boston, Mass., Feb. 18 and 19, 1903.

First Day, Feb. 18—Morning Session.

The Thirty-third annual meeting of the New England Association of Gas Engineers was called to order, the morning of February 18th, by the President, Mr. Wm. E. McKay, of Boston. The recorder's desk was occupied by the Secretary, Mr. N. W. Gifford, of East Boston.

On motion of Mr. Leach, the reading of the minutes of the last meeting was dispensed with.

The Secretary then read the

Report of the Board of Directors,

the first portion of which related to

Additions to and Changes in Membership.

The Board recommended the election of the following gentlemen:

Active.

Bill, B. P., Montpelier, Vt.
Brown, J. S., Clinton, Mass.
Brockington, Leominster, Mass.
Carson, F. H., Laconia, N. H.
Cathels, Edmund, Prov., R. I.
Earle, A. G., Bristol, R. I.
Humphrey, C., New Bedford, Mass.
Lomax, C., Everett, Mass.
Leland, G. B., Norwich, Conn.
Polk, R. W., Rutland, Vt.
Philbrick, J. E., Brockton, Mass.
Tait, F. M., New London, Conn.
Wing, John F., Boston, Mass.

Transfer from Associate to Active.

F. W. Mace, Lynn, Mass.

Associate.

Barnes, F. G., New Haven, Conn.
Campbell, W. F., Boston, Mass.
Chisholm, C. F., Revere, Mass.
Dickie, W. L., Boston, Mass.
Dowst, F. B., Jamaica Plain, Mass.
Hall, A. E., East Boston, Mass.
Kerr, J. B., Dedham, Mass.
Magee, J., Chelsea, Mass.
Meinshausen, H., Chelsea, Mass.
Motley, G. S., Lowell, Mass.
Russell, D. B., South Boston, Mass.
Starkweather, R. M., Northampton, Mass.
Tucker, C. A., New Haven, Conn.
White, H. E., New Haven, Conn.

Honorary.

The Board also recommended the election to honorary membership of Mr. A. B. Slater, of Providence, R. I.

Election of New Members.

On motion of Mr. C. F. Prichard the Secretary was instructed to cast the ballot of the Association in favor of the election of the gentlemen named. Messrs. W. A. Learned and F. C. Sherman were appointed tellers. The Secretary subsequently reported that the ballot had been cast as directed, and the President formally announced the result.

The recommendation of the Board regarding the election of Mr. Slater to honorary membership was then put before the Association. A rising vote was taken and the nominee was declared unanimously elected, which action was formally announced by the President.

The consideration of the report of the Directors respecting the Library Fund was postponed, and Vice-President McGregor assumed the Chair, while President McKay read the following

INAUGURAL ADDRESS.

It is an honorable privilege to preside at a meeting of the oldest Gas Association—the only Association of Gas Engineers—in the United States. It is a pleasure to greet you with the knowledge that death has not lessened our membership since our last annual meeting.

The most important occurrence of the year, in New England, has been the strike of the miners of anthracite. Not only has the price of coal doubled and trebled, but in the last stages of the strike it was practically impossible to get anthracite at any price. Extending through 6 months, the effect of the strike made coal scarce in Boston, in July, 1902; in August the price had risen to $10 per ton; in September it rose to $12, then to $15; this last being nominal, for dealers would not accept orders. Cold weather turned people to seeking substitute fuel, and the advance of 40 per cent. in the retail prices of wood and oil left alone gas to hold the dual honor of an uninterrupted supply and of an unchanged, uniform, low price. Although the duty was taken off coal it devolved upon gas. In November and December, 1902, and January, 1903, the output of gas increased at an unprecedented rate, the largest cities showing 20 and 25 per cent., while some of the smaller cities had an even larger percentage increase. The harmonious operation of combined coal and water gas plants lessened the inconvenience of the anthracite shortage, and made less difficult the response to the extraordinary de-

mands on the gas supply. For some years the commercial side of our industry has been to the front, but the coal strike was such an insistent and effective solicitor for new business that the questions of manufacture and distribution again begin to push for precedence. The increase in the price of coals and oils, without a proportional advance in the selling price of gas or reduction in the candle power, still leaves us the hope for better results from the materials of manufacture.

It must always be a memorable credit to our industry that, in the very trying times of this winter, we have successfully met every demand for gas, maintaining the high standard of quality without raising the rate to the consumer. It is generally expected that the recent education in the use of gas for cooking and heating will make permanent the exceptional consumption induced by the coal shortage. When we consider that this shortage was due to a decrease of only 5 per cent. in the annual output of coal, we must realize that the higher the civilization of a people the more interdependent is all industrial welfare, and a serious economic disturbance can follow a remarkably slight disarrangement of the normal relation between production and consumption. If it is coal one year it may be oil the next, and prudence suggests the multiple equipment of plant equal to all exigencies.

A banner year of construction must be near at hand, and as the engineer is, in the ultimate, the responsible factor, engineering knowledge and judgment will be in more constant requisition in every direction. Andrew Carnegie, in his rectorial address at St. Andrew's University, said: "Business methods have changed in the past 20 years. The old rule-of-thumb has given place to scientific precision. The technical schools furnish the young foremen and superintendents. Automatic machinery has developed a new class of workmen more intelligent than the old. The size of works has increased tenfold, and all processes are combined in one." This is just as true of gas as of steel and iron. As enduring success demands a business basis, the mercantile view of our gas undertakings must have an ever widening horizon. The companies that were small a few years ago are now large. The growth has been prodigious; but if we are to surpass our European contemporaries, output per capita promises that the future will realize an active demand exceeding even the general expectation. We seldom build too big, when the smaller cost per unit of capacity is considered, and not infrequently the new business exceeds anticipation. The experience of this winter enforces the wisdom of making the capacity of plant and the provision for new business as ample as means will permit. Construction companies can substantially promote the common adoption of rational standards, reducing some costs to gas companies without lessening builders' profits. The occasionally divergent views of those who build and of those who operate apparatus are appropriate reasons why the careful and scientific observations by superintendents should be more frequently formulated for the benefit of the profession.

The installation of inclined retorts is progressing close at home, and the combination of American coals and New England management forecasts a successful issue.

Purification has always been attentively studied, and still occupies an exceptional share of our care. I suppose that a reason for this exists in the legally defined duty of this part of the apparatus. In purification individual experience has not provided an acceptable guide to universal practice. The development of the very deep purifiers has met with much approval, and now has the additional recommendation of adoption in our territory. In this connection it may be noted that the reversal of flow of gas in purifiers (by which the serviceable activity of the material is renewed) may, with a dry center seal, be tested for two purifiers by turning the valve 45° instead of the usual 90°.

While English and Canadian gas coals have reappeared in some works, the experience of this winter has established some relative values for water gas making in petroleum coke, Welsh authracite, retort coke, retort carbon, oven coke, and even semi-bituminous coal. Texas oil has been prominent in our print, and there has been some expectation of its introduction for large use in water gas. Mr. Rollin Norris, at the New Orleans meeting of the Western Gas Association, stated: "Analyses show that, for equal candle powers, the proportion of heavy hydrocarbons in gas from Beaumont oil is about 75 per cent. of what it is in gas made from Ohio or Pennsylvania oils. The result is that the gas made from Texas oil loses its candle power more readily under the influence of low temperature."

To judge from the reports of the State Board of Gas and Electric Light Commissioners, the residual market must be permanently satisfactory. For the companies making coal gas the returns from sales per ton of coal carbonized are larger for 1902 than for any year since 1899, increasing slightly each year, The year has done much to educate coke consumers, and in view of the shortage of fuel of all kinds (except gas) this winter, it is ancient history to read that, in January, 1879, the Boston gas works had 10,000 tons of coke stored for sale!

The pioneers of high pressure distribution receive well earned commendation, but the undetermined features of this system leave it still a field for serviceable investigation. The important effects of compression upon candle power are not yet clearly stated, the limit of profitable compression has not been defined, and the flow of gas under high pressure has not yet been reported as the result of accurate and complete experiment.

The increasing use of the public streets for many kinds of distribution is a forcible reminder that first comers are first served to the best locations; and provision for large increase of business is more than ever apparent in the sizes of mains laid. Leaks of gas are not always from gas mains, and the electric currents are a disturbing factor in many unexpected ways. Gas companies whose mains are damaged by electrolysis are interested in the decision of Judge Brown, of the Court of Common Pleas, Montgomery County, O., in the case of the city of Dayton vs. the City Railway Company, April 5, 1902. He said: "The defendant has been and is operating its road in a negligent manner, causing continual damage to the water pipes of the plaintiff, for which the plaintiff has no adequate remedy at law, and cannot by any practical method prevent such damage. It is no excuse in law, and the facts would not justify the defense, that other electric lines in Dayton are contributing to this or doing like damage. It is, therefore, the duty of the Court to enjoin the defendant from so operating its railway, and to compel it, within a reasonable time, to introduce such improvements in the system, in order that the operation of the single trolley system will be in accordance with the present standard of the art of operating single trolley roads. The plaintiff shall co-operate to that end." It seems, however, to be conceded that the only entirely satisfactory remedy for electrolysis is to provide for an independent conductor for the return of the current to the generator, completely insulated from the rails and from the ground. Electrolysis is only one of a number of causes that tend steadily to increase the cost of distribution of gas.

The extension of the use of gas for all purposes will result in a greater sensitiveness in the output as affected by the weather, by cold, or by rain and fog; the increase on cold, dark days will be extreme in amount, and will influence the needs in holder capacity.

Although more than half a million of the Welsbach mantles have been sold in New England in the past 6 months, and careful estimates of the use of the Welsbach state that 90 per cent. of the gas lights in Germany, and 50 per cent. in England, are so equipped, yet here the majority of gas consumers still use flat flame burners. The success of the arc or cluster lights has been phenomenal; this effective illumination has invaded mills and factories that had long been relinquished to the electric light. Much mutual benefit follows the use of their specialized or expert information by gas companies in supplying the needs of consumers; the maintenance and care of appliances, including incandescent mantles, after their installation will best sustain the merits of the appliances, and advertise the company's helpful interest in the consumer.

The Gas Commissioners report the number of stoves in use in Massachusetts as follows:

Year.	Number.
1896	42,592
1897	70,222
1898	78,558
1899	77,403
1900	88,201
1901	111,162
1902	126,535

No doubt this winter will show a percentage increase greater than ever. These figures show the effect of persistent educational work by the companies concerned. In Boston a number of large sized ranges have been installed in hotels and hospitals. The growing use of gas for heating lends fresh importance to the closely allied subject of ventilation; hitherto we have not paid to this feature the attention properly its due.

A signal feature of the year has been the use of gas engines of large sizes in central electric stations, on alternating current generators running in parallel. The merits and limitations of the steam engine are well known, but the possibilities of the gas engine tempt the imagination. Birmingham, England, is about the size of Boston, and Mr. Hunt states that the Birmingham gas undertaking supplies 19,000-horse power, using annually 800 million cubic feet of gas, and that this is entirely the growth of recent years.

In Massachusetts the gas supply has been taken over by the munici-

pality of Holyoke, a city of 50,000 people. It may be of interest to note the rules adopted for the valuation of the property of the former Holyoke Gas Company.

1. The value of the real estate for what it was worth in the market as a part of the plant.

2. The cost of reproducing all parts of the buildings and machinery that could be duplicated, and the market value of such parts as could not be reproduced.

3. Depreciation from age, use, or other cause, of the existing plant to be deducted from the valuation of the reproduced plant as above determined.

I am glad that we have among our members the managers of at least two out of the four municipal gas plants in Massachusetts. The engineering interest of a gas plant lies in the management, not in the ownership.

In Germany, where our profession draws recruits in scores from the young graduates of the many technical schools, commercial chemistry and practical physics contribute in a marked degree to industrial progress and continual dividends. The laboratory is not a student's retreat, but a valuable business ally.

In its long and active life, this Association has done much in the development of gas engineering. The value of the papers presented does not measure the entire service of the Association to its members; the discussion of methods and facts, and the absorption of the ideas and experience of others have always been a stimulus not only to the participants, but to the silent as well.

In preparing a list of the printed papers that have been read before this Association, I was impressed anew with the great value of the material that is now filed only in the columns of the American Gas Light Journal. There was a freedom of debate in the early meetings that could profitably be copied now, and members were willing and eager to speak their minds. "Advice," says Fenimore Cooper's Leather Stocking, "is not a gift, but a debt that the old owe the young." And advice and knowledge were willingly received and freely imparted. Messrs. Lamson, Prichard and others have directed attention to the increase of scientific knowledge in the members of the Association, but technical training will be handicapped if it ties its own tongue. The desire to state only facts, and to speak with exactness, is laudable, but to read some of the earlier debates it appears that members were then equally careful in statement, but much more ready to share in the discussions. I think the publication of our proceedings, both present and past, is an important work that should be promptly undertaken.

A familiarity with engineering literature is of very great value, and though our nearest interest is in a convenient reference to our own proceedings, it is of equal worth to be able to consult current information on many allied engineering subjects. A plan has been formulated to secure to members the opportunity to accomplish both these purposes, and to give the Association the use of a library as its headquarters. I commend this plan to your favorable consideration.

"No man," says Emerson, "Can do anything well who does not esteem his work of importance." Common sense recognizes the importance of the gas industry to the health, the comfort and the morals of the community. If "light is the great policeman," it is also true that the use of artificial light is an exponent of the education and civilization of a people. In relative importance to our profession, the engineering society follows close upon the engineering college. As experience alone can round out the judgment in dealing with technical matters, the publication of the experience and knowledge of one is a certain help to many; and the engineering society is the medium naturally chosen for the discussion of accomplished facts rather than hopeful theories. The better the preparation of the engineer the better the results in economy of construction and operation. The earning power is sometimes gauged by the learning power. Scientific training is, to the modern engineer, what the sights and rifling are to the modern gun; it "Condenses effort and accelerates the attainment of result." Our engineers also occupy executive positions in increasing numbers. A good administration is to be expected as the natural function of a logical mind, a mind trained in the fundamental principles of science, and backed by judgment and self confidence.

This Association deals with the economic application of elemental facts; but though we come here with our heads filled with facts, we have need of and we receive much more than the mere recitation of experience, for the New England Association is strong in kindly sympathy and in fellowship; and it is a pleasant duty of your President to welcome the new members, and to give expression to your wish that the cordial and friendly relations which characterized the first meeting of the founders, in 1871, will always endure, and grow deeper and stronger with each succeeding session.

On motion the address was referred to a committee, consisting of Messrs. Chas. F. Prichard, H. A. Allyn and F. C. Sherman, for consideration and report.

[To be continued.]

ABSTRACT OF THE PROCEEDINGS OF THE TENTH ANNUAL MEETING, MICHIGAN GAS ASSOCIATION.

Held at Battle Creek, Mich., Feb. 18 and 19, 1903.

First Day, Feb. 18—Morning Session.

The meeting was called to order at 10:30 A.M., by President John J. Knight. On motion the roll call was postponed until afternoon session and the reading of the minutes was dispensed with.

Report of Executive Committee.

The Executive Committee submitted the following report:

Battle Creek, Feb. 18, 1903.

To the Members of the Michigan Gas Association: The Executive Committee beg to report as follows: They recommend that the Nominating Committee shall consist of Messrs. W. H. Barthold, A. L. Zwisler, and E. F. Gallagher. They recommend that the following be elected to membership.

Active.

F. W. Blower, General Manager, Kalamazoo (Mich.) Gas Company.

S. Van Ostrend, Treasurer, Light, Fuel and Power Company, So Haven, Mich.

A. C. Runyan, President, Light, Fuel and Power Company, So. Haven, Mich.

S. L. Munroe, Partnership, Grand Haven (Mich.) gas works.

G. E. Harris, Superintendent, The Marshall (Mich.) Light Company.

W. H. Barthold, Supt. of Mfg., Grand Rapids (Mich.) Gas Light Company.

W. F. Dewey, Ass't Supt. Mfg., Detroit City (Mich.) Gas Company.

W. H. Loutit, Grand Haven (Mich.) gas works.

R. Schaedele, Manager, Albion (Mich.) Gas Light Company.

R. Schacklette, Cashier, Adrian (Mich.) Gas Company.

W. L. Ward, Supt. Appliance Dept., Saginaw City (Mich.) Gas Company.

J. H. Findlay, Supt., Charlotte (Mich.) Gas Company.

Florence E. Morgans, Secy. and Treas., Pontiac (Mich.) Light Company.

E. C. Lovett, Western Manager, Wm. M. Crane Company, Chicago, Ills.

Associate.

J. J. Dickerman, Manager, Benton Harbor and St. Joseph (Mich.) Gas Company.

F. Holmes, Salesman, Ideal Mfg. Company, Detroit, Mich.

N. A. Leakey, Asst. Sec., Michigan Ammonia Works, Detroit, Mich.

C. T. Mason, Salesman, Geo. M. Clark & Co., Chicago, Ills.

J. B. McNary, Manager, Canadian Meter Company, Windsor, Ont.

F. E. Sherriff, Western Gas Construction Company, Fort Wayne, Ind.

H. I. Lea, Asst. Engineer, Western Gas Construction Company, Fort Wayne, Ind.

C. R. Lindsey, of Lindsey & Co.

F. V. Bartlett, Gen. Mgr., The Ideal Mfg. Company, Detroit, Mich.

F. W. Best, Fixture Salesman, Gaites, Pearce & Co., Brooklyn, N.Y.

W. E. Steinwedell, Secretary, The Gas Machinery Company, Cleveland, O.

Transfers.

That C. H. Raynor be transferred from active to honorary membership, and that G. E. Harris, Supt. of Marshall (Mich.) Light Company, be transferred from associate to active membership.

We have received the following resignations and recommend that they be accepted: C. M. Gunther, Philadelphia, Pa.; A. J. Emlaw, Grand Haven, Mich.; A. S. Gales, Albion, Mich.; H. W. Collins, Detroit, Mich.

We recommend that the following be dropped from membership for non-payment of dues:

Active.

M. H. Gaskorn.	J. H. Dykeman.	W. H. Hartman.

Associate.

Geo. B. McClellan.	John R. Moon.	P. S. Dickey.

The following papers have been presented to us, and we recommend that they be read:

"Changing from Artificial to Natural Gas," by Frank H. Hess, Marion, O.

"The Details of the Business," by D. Henning Frazer, Battle Creek, Mich.

"Maintenance of Arc Lamps," by Harry B Wales, Grand Rapids, Mich.

"Placating the Public," by E. P. Davis, Mount Clemens, Mich.

"Loss of Illuminating Power of Mantles While Burning," by A. H. White and M. E. Muller, University of Michigan.

On motion, the report was adopted.

The President then read his annual address, which, on motion of Mr. Paul Doty, was referred to a committee to be appointed by the Secretary, who subeequently appointed thereon Messrs. B. C. Cobb, S. E. Wolfe and E. F. Lloyd.

The Secretary and Treasurer read his annual reports, which were received and placed on file.

Appointment of Committees.

The President appointed the following committees:

On Resolutions on the Death of S. Milo Dole.—Geo. E. Harris, Paul Challis, R. Shacklette.

On Nominations.—W. H. Barthold, E. F. Gallagher, A. L. Zwisler.

On Place of Next Meeting.—B. C. Cobb, E. P. Davis, S. E. Wolfe.

The paper of Frank H. Hess, of Marion, O., on "Changing from Natural to Artificial Gas," was then read by the Secretary, Mr. Hess not being present. After a vote of thanks to Mr. Hess, the morning session adjourned.

First Day—Afternoon Session.

ROLL CALL.

Roll call showed the following were present at the meeting:

Auger, R. H.	Findlay, J. H.	Munroe, S. L.
Bartlett, F. V.	Frazer, D. H.	Persons, F. R.
Barthold, W. H.	Forbes, C.	Ray, R. S.
Baxter, I. C.	Gallagher, E. F.	Robinson, B. C.
Blower, F. W.	Harris, G. E.	Runyan, A. C.
Burnett, C. H.	Holmes, T.	Schaddelee, R.
Calkins, J. M.	Howden, F. J.	Shacklette, R.
Campbell, E. D.	Howden, J. J.	Sherriff, F. E.
Challis, P.	Humphreys, A. H.	Steinwedell, W. E.
Church, L.	Knight, J. J.	Stirling, J. C.
Cobb, B. C.	Knowlson, A. T.	Traver, A. F.
Corbus, F. G.	Lawrence, F. M.	Turner, G. C.
Cunningham, J. R.	Leakey, N. G.	Van Ostrend, S.
Davis, E. P.	Lindsey, C. R.	Ward, W. L.
Dean, S.	Lloyd, A. G.	West, W. D.
Dewey, W. F.	Lloyd, E. F.	Weston, J. A.
Doty, P.	Loutit, W. H.	Whelan, T. J.
Douglas, H. W.	Lovett, E. C.	White, A. H.
Duffy, I. N.	Lunn, J. T.	Wickham, L.
Eaton, A. B.	Mason, C. T.	Wolfe, S. E.
Eaton, J. R.	McNary, J. B.	Zwisler, A. L.

The following papers were then read and discussed:

"The Details of the Business," by Henning Frazer, Battle Creek, Mich.

"Maintenance of Arc Lamps, by Harry P. Wales, Grand Rapids, Mich.

"Placating the Public," by Emory P. Davis, Mt. Clemens, Mich.

A Brace of Invitations.

Mr. Frazer extended to the Association an invitation to attend a theater party and supper, which was accepted, and the meeting then adjourned to reassemble the following morning.

Second Day, Feb. 19—Morning Session.

The meeting was called to order by President Knight at 10:30. Professor A. H. White and M. E. Miller then presented the annual scholarship paper, the title of which was "The Loss of Illuminating Power of Mantles While Burning," which was followed by a brisk discussion.

Report of Committee on Scholarship.

The Committee on Scholarship reported in favor of continuing the work for another year, and asked that all making pledges for this purpose continue the same, and on call of the roll the following assented:

Name of Subscriber.	Amount.
Detroit City Gas Co	$100
Grand Rapids Gas Co	100
Jackson Gas Co	50
Ann Arbor Gas Co	50
Adrian Gas Co	$15
Kalamazoo Gas Co	50
Battle Creek Gas Co	25
Pontiac Gas Co	15
Monroe Gas Co	10
Flint City Gas Co	15
Ypsilanti Gas Co	10
F. R. Persons	10
A. T. Knowlson	10
Geo. M. Clark & Co	10
Standard Lighting Co	10
J. T. Lynn	50
Parker Russell M. & M. Co., St. Louis, Mo.	25
Saginaw City Gas Co	25
E. F. Gallagher	10
Mt. Clemens Gas Co	10
Marshall Light Co	10
Owosso Gas Co	10
Windsor Gas Co	10
Muskegon Light & Traction Co., by J. J. Howden	15
Coldwater Gas Co	10
D. McDonald & Co., Albany, N. Y.	10
R. H. Augerp	5
Michigan City Gas Co	10
Connelly Iron Sponge & Gov. Co	10
Lloyd Construction Co., Detroit, Mich.	15
Western Gas Construction Co., Fort Wayne, Ind	15
Eclipse Gas Stove Co	20
Kerr Murray Mfg. Co., Fort Wayne, Ind	10
Weston & Lawrence, of Detroit Stove Works	25
J. R. Cunningham	10
I. C. Baxter	10

The Secretary was instructed to communicate with all formerly making pledges, but not present at the meeting, in regard to the continuation of the same.

Report of Committee on Nominations.

The Committee on Nominations made the following report:

Battle Creek, Mich., Feb. 19, 1903.

To the Members of the Michigan Gas Association: Your Committee on Nominations, after due consideration, present the following nominations for officers for the ensuing year:

President—B. C. Cobb, Gen. Manager, Saginaw City Gas Company.
Vice-President—S. E. Wolfe, Gen. Manager, Jackson Gas Company.
Secretary and Treasurer—H.W. Douglas, Ann Arbor Gas Company.

Respectfully, W. H. Barthold, E. F. Gallagher, A. L. Zwisler, } Committee.

Election of Officers.

On motion, the report was adopted, and the gentlemen named were declared elected as officers for the ensuing year.

Report of Committee on President's Address.

The Committee on President's Address presented the following report, which was adopted:

Battle Creek, Mich., Feb. 19, 1903.

To the Members of the Michigan Gas Association:

Your Committee on President's Address respectfully submit the following report:

The members of this Association are to be congratulated on having had the opportunity of listening to such a masterful and comprehensive statement of the past, present and hoped-for future conditions of the gas business as is contained in our President's address.

The points touched upon are so far reaching in their scope and of so much importance to every gas company and gas man in the State, that we, as members of the Association, and individually, should give them careful and earnest consideration.

Never in the history of the gas business have conditions demanded more conscientious work, painstaking investigation and consistent effort on the part of gas managers and engineers than at the present time.

We have already entered a period of agitation for municipal ownership, demands for reduced rates and large increases in the valuation of our properties, and this latter at a time when nearly every article of

material and labor is costing us from 25 per cent. to 100 per cent. more than when the majority of the existing rates for selling gas were made.

We, as a committee, do not feel competent, particularly in view of the short time given for reporting on the valuable suggestions of our President, to recommend or propose definite or conclusive treatment of the important matters in hand. We do, however, heartily agree with him that there is a seeming lack of interest in the work of our Association by many of its members. In proof of which may be cited the small attendance at this meeting, and the great difficulty experienced in obtaining papers treating upon the various interesting and essential points of our business or profession. The lack of discussion and expression of opinion and experience by the members present at the meetings is noticeable and to be regretted.

We do not doubt the ability of our members to materially increase the value of the work of this Association, and feel sure that if proper efforts are made we can increase our membership and establish ourselves upon a higher plane of usefulness and one more in accord with the views of our President, equaling that standard of progressive excellence attained by some of our sister Associations.

In reference to the advisability of prolonging the duration of the meetings from two to three days, we would suggest that the opinions of the members present at this meeting be obtained and, if consistent with the by-laws of this Association, that a vote be taken upon the question.

In considering the suggestions for the establishment of an "Engineering Board," "Board of Managers," and a "State Gas Commission," your committee feel that these innovations are of such importance, and that they may be of such incalculable value to our companies, if properly and judiciously created and managed, that it would seem advisable that the retiring President appoint a committee of from three to five members, whose duty it shall be to report at the next meeting of this Association the feasibility and a detailed plan of the work to be accomplished and how to accomplish it. This committee regrets to confess that it has very little, if any, knowledge of the workings of the Massachusetts Gas Commission and the laws governing that body, and would recommend that the committee appointed obtain, if possible, a copy of the act creating such a Board, defining its functions, powers and limitations.

We feel sure that the members of this Association will grant that, in cases of dispute, the claims and rights of gas companies would, before such a Board of the character and ability contemplated, be better assured of justice and fair dealing than before the sometimes irresponsible municipal councils.

In closing, we wish to express to our esteemed retiring President the Association's appreciation of his thoughtful, conscientious work, and to assure him that in our opinion the many valuable suggestions by him introduced ought to bear golden fruit.

Respectfully submitted,

E. F. Lloyd,
S. E. Wolff, } Committee.
B. C. Cobb,

The Chairman appointed Messrs. Paul Doty, W. M. Eaton and H. D. Walbridge as a committee suggested in this report.

Report of Committee on Resolutions.

The Committee on Resolutions rendered the following report, which was adopted:

Whereas, The Creator, according to His Divine Providence and Wisdom, has removed from our midst our dear brother and Vice-President, S. Milo Dole, of Adrian, Mich., whereby the Michigan Gas Association has lost one of its most earnest and valuable members; be it therefore,

Resolved, That this Association extend to Mrs. Dole and family our most heartfelt condolence and sympathy in the loss of a loving husband and father, and earnestly commend Mrs. Dole and the two dear little boys to Him, who has promised to comfort the widow and be a Father to the fatherless, and that a copy of this resolution be sent to Mrs. Dole. Most respectfully,

Geo. E. Harris,
Paul Challiss, } Committee.
R. Shacklette,

Report of Committee on Next Place of Meeting.

The Committe on Place of Next Meeting reported in favor of Saginaw, which was adopted by the Association.

Vote of Thanks.

After a vote of thanks to the Battle Creek Gas Company and to the retiring President, the meeting was declared adjourned.

Four Months' Experience with Gas Engines.

[A paper read by Mr. George MacMillan, of La Crosse, Wis., at the Second Annual Meeting of the Wisconsin Gas Association.]

At the request of our faithful Secretary I submit this brief paper on our short experience with the use of gas engines. It is not the purpose to enter into a general discussion of the gas engine problem. The endeavor will be to state as briefly as possible the result of that experience during the past four months we have had them running, together with certain deductions as to efficiency. The adoption of any method of motive power will be determined by the conditions prevailing at any given place, for any given purpose. The first cost of the installation, the cost of steam fuel, the character of the services to be required, whether a constant load of certain horse power or an intermittent load, such as occurs in an ordinary electric lighting station which is being maintained for commercial purposes, are questions requiring great care and consideration before a final decision is reached. After making as thorough an investigation as we could of the conditions confronting ourselves, we concluded it would be to our interest to install gas engines for our street lighting system. Our plant consists of two 85-horse power gas engines of the tri-cylinder type, with one explosive impulse for each revolution of each piston. The charge of gas and the force of the explosion are always proportioned to the power developed. The regulation of speed is perfectly steady. Each engine is belted to one No. 12 multiple arc Brush dynamo, each having capacity of 115 lamps. The circuit current is 6.6 amperes and 73 volts in the lamp, equal to 482 watts. Our No. 1 engine is carrying a load of 99 lamps, and the No. 2 engine 103 lamps. The No. 1 engine has been in continuous use since the latter part of last April; but, as it had only a comparatively small and changing load until October 1st, the results obtained during that interval, though fairly good, will be eliminated from the present calculation. The 99-lamp circuits, or loops, have 17¼ miles of line copper and the 103-lamp circuits 18¾ miles. The No. 1 engine (with 99 lamps) consumed 2,048,200 feet of gas and developed current for 116,015 lamp hours, being 17.65 feet per hour and 27.3 watts per foot.

The No. 2 engine (103 lamps) used 2,401,700 feet, and produced current for 118,234 lamp hours, equal to 20.31 feet per lamp hour, or 23.73 watts per foot. By the exchange of loads we have discovered that the reason for the seeming excess of gas used by the No. 2 engine is caused by a defective meter.

The results as thus far reported exhibit the efficiency at the lamp in each case, and it appears lower than it really is. If we assume circuit line loss at 10 per cent., dynamo efficiency at 87 per cent., and belt loss at 2 per cent., the efficiency at the engine will figure out about as follows:

Lamps at 482 watts each, and allowing 10 per cent. line loss, then at the station each lamp will demand 482.90, or 535 watts, for each lamp. Again: Assuming that the dynamo efficiency is 87 per cent., then the the belt must deliver to the dynamo 535.87, or 615 watts. per lamp at the generator.

Further. Taking 2 per cent. as fairly representing belt friction and slippage, the energy required at the engine will be 615.98, or 627 watts for each lamp at the engine, after allowing for line loss, dynamo inefficiency and belt friction, and figures out in the case of the No. 1 engine, 35.5 watts, and with No. 2, 30.9 watts per foot of gas used. Pursuing the calculation further and reducing results already described to the conditions of kilowatts and gas required for the development of 1-horse power, it works out as follows:

Engine No. 1 has 99 lamps. Then, 99 by 627 equals 62.073 kilowatts, equals 83.21-horse power developed.

Engine No. 2 has 103 lamps, Then, 103 by 627 watts equals 64.581 kilowatts; 64.581746 kilowatts equals 86.57-horse power developed.

The No. 1 engine is, therefore, producing a horse power hour, with 20.9 feet of gas, or at the rate of 36.6 feet per kilowatts hour, and the No. 2 engine is using 25.29 feet per horse power, or 42.17 feet per kilowatt hour. We are using ordinary coal gas of good illuminating quality. We have not tested it for heat units.

In relation to the same power developed by other means, the oil required for lubricating a gas engine is very much in excess. The cost of water for cooling the engine, cost of renewing igniters, and the attention required in keeping them clean and in order, are items of considerable importance that we did not consider in our original calculation. All things considered we are not sorry we have made the experiment, but it must be confessed we are not getting as good results as we were led to believe we should get.

This paper may seem like dry matter to many of the members of this

Association—more especially to those members not engaged in the supply of electric current to the public; but a knowledge of what may be done, and is being done, with gas by means of the gas engines in the development of motive power, ought to have some interest for all, as furnishing a market for the sale of more gas.

Ammonia Concentration at Gas Works.

[A paper read by MR. JOHN S. UNGER, at the Second Meeting of the Wisconsin Gas Association.]

At the prevailing prices of ammonia it would pay most coal gas works to save their ammoniacal liquor and install an ammonia concentrator, to work the liquor up to a strength of from 18 to 24 per cent. of ammonia. It is comparatively easy to manipulate the scrubbing of the gas so that the resulting weak liquor will have a strength of from 1 to 1½ per cent. of ammonia. There are generally two scrubbers, and while fresh water is required for the last scrubber, the weak liquor can be fed into the first scrubber over and over again until a strength of about 1½ per cent. is obtained. It becomes then a matter of calculation as to interest on investment, cost of fuel and labor, and the market price of ammonia at the works, whether it will pay to save the ammonia.

A still can be so made that it can be easily manipulated by the most ordinary labor, and generally there is some help around a gas works which at times can be put to run the still, so that the extra outlay for labor would be trifling. The superintendent could soon learn to make the necessary analysis, and after a while he will find that such work will take very little of his time. There ought also to be one spare boiler at the works, which could be fired up to run the still in case the regular boiler is not large enough for the extra drain required.

It is the opinion of the writer that one reason why many small coal gas works allow their liquor to go to waste is the lack of knowledge about the process of concentration, and this paper is written with a view of explaining the construction of a suitable apparatus and the operation of same, and to help the superintendent to select and get the best for the money.

It does not pay to buy an apparatus because it is cheap. A small and cheap still will have to be run very slowly to get any efficiency. The depreciation will be high, and the parts are generally so cramped and difficult to clean that great waste will periodically occur. It is better to buy a larger still so made that stoppages are not liable to occur, and will not have to be kept running all the time, which at small gas works might be inconvenient; besides, the still should be made sufficiently large to allow the liquor to remain in it for a suitable time, otherwise there will be a waste from insufficient boiling.

In connection with a good still there should also be a good separator for eliminating all the tar from the liquor, and a well for storing the weak liquor for say a week's make. There should also be a storage tank for storing sufficient concentrated liquor to fill a tank car, if the ammonia is to be shipped by rail.

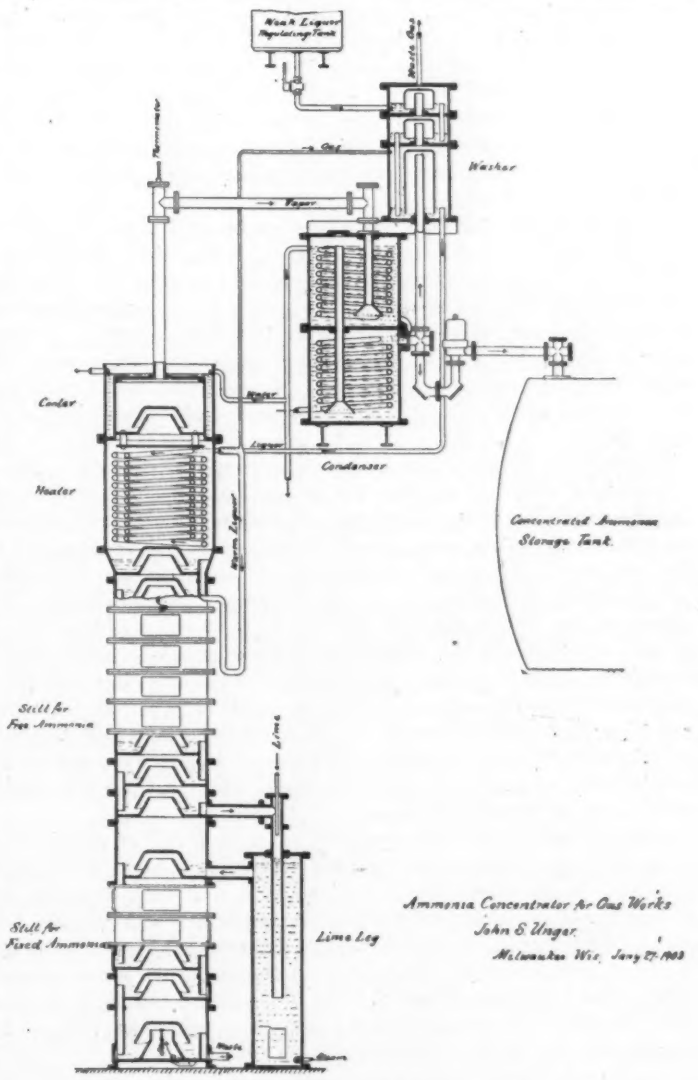
In the illustration the writer has endeavored to show a complete ammonia concentrator suitable for gas works, the diameters and heights varying with the capacities required. For very small works the apparatus could be simplified by leaving out the lower part of the still, whenever the return from the fixed ammonia contained in the liquor becomes so small that it does not warrant the extra trouble and expense.

Modern stills are all heated by steam led directly into the liquor, and they consist of cast iron, cylindrical compartments provided with conical openings in the bottom. Over each conical opening there is a cast iron hood with serrated edge, and each compartment has a separate channel for directing the liquor on its course downward.

Steam enters at the bottom of the still, and first comes in contact with liquor from which the free ammonia has already been driven out in the upper part of the still, and which has been mixed with lime water, in order to drive out the fixed ammonia in the lower part of the still. The lime water may be injected into the still by steam injectors, but an objection to this method is that a good deal of unnecessary cold water must be fed in with the lime in order that the injectors may work properly. A better way is to pump the lime water in a manner already explained by the writer to this Association a year ago; and if the lime mixer can be driven with a belt from the gas exhauster, such method may also be quite convenient in small gas works.

The principle of the lime leg is to provide some additional mixing space for the lime water and liquor, and also to have a space for the heavy matters in the lime to settle rather than to stop up the still.

The vapors next entering the upper part of the still liberate the free



ammonia, and then enter the part marked "heater," where the vapors are cooled and the weak liquors in the lead coils heated, forming a very necessary and efficient part of the apparatus. The vapors are further cooled with water, surrounding the top of the still and marked "cooler," until a certain temperature is reached, which will correspond to the desired strength of the finished product. In the process of cooling in the upper part of the still water vapors will condense at a temperature in which they have comparatively little ability to retain the ammonia, so the effect of the cooling becomes a drying of the vapors, a process which has a certain relation to the amount of cooling effected. The temperature at the top of the still will, therefore, be a gauge as to the amount of ammonia in the vapors, and it will form the chief guide for directing the strength of ammonia in the finished product.

From the still the vapors enter the condenser, also called the absorber, when all the vapors are cooled to a temperature nearly the same as that of the entering water. The condenser shown is made in two compartments, the vapors thereby being gradually cooled off, so that no sudden cooling will precipitate ammonia salts. The cooling water enters the lead coil from below. The concentrated ammoniacal liquor overflows from the lower compartment of the condenser into a cross, then through a seal pipe up into an overflow pot, covered with a glass jar for ready observation and the taking of samples, and next into a storage tank. This tank can readily be placed sufficiently high that tank cars can be loaded from it by gravity.

There are some gases liberated from the liquor which do not condense, and as these may be the cause of some loss of ammonia, a small washer is placed above the condenser, through which the weak liquor passes on its way to the still. A regulating tank should be placed above the washer, so that the weak liquor may have a constant head, and thereby a uniform flow be secured. This can be done by slow pumping, keeping the tank always full, and allowing the surplus liquor to overflow back to the well.

The washer also takes care of the gases that will escape from the weak liquor in the coils of the heater, when the liquor is heated to a temperature of from 160° to 180°. A disassociation of the ammonium carbonates will then occur, and carbonic acid be liberated, while at that tempera

ture the water has still sufficient ability to retain its percentage of ammonia. In this way very little ammonia will escape with the carbonic acid and other gases, and whatever does escape is taken up again by the liquor in the washer. By this means a considerable quantity of carbonic acid may be eliminated from the liquor before it enters the still, which is very important, if it is desired to concentrate the liquor above 18 per cent., the ammonium carbonate being the cause of salting in condenser and storage tank.

The waste liquor leaves at the bottom of the still through a seal of sufficient depth to overcome the pressure in the still. The waste is thereby made perfectly automatic, and requires no attention. The bottom compartment of the still should be provided with a pressure gauge, conveniently made up of a glass U-pipe filled with mercury. A glass water gauge should also be placed here, and one water gauge in the bottom compartment of the upper still. The steam should have a uniform pressure, and it is well to place a pressure regulating valve in the steam pipe.

The operator should watch his pressure gauge, observe the temperature at top of still, and regulate the steam admittance and flow of the liquor, so that the pressure and temperature may be kept uniform, at the same time that the waste should be practically free from ammonia. The lime mixer will require some occasional attention, but with everything working uniformly a man's whole time will not be needed. The apparatus can be left idle over night, but in order to save heat it may be well to let some of the waste exhaust steam at the gas works keep it warm over night. In selecting materials for the apparatus it must be remembered that the warm vapors in the upper parts of the still have a very injurious effect on wrought iron, so that this material should be entirely omitted in the interior of the heater, cooler and condenser; the coils should be made of lead, any other parts coming in contact with vapors to be made of cast-iron.

As to the amount of steam required for each pound of ammonia in the liquor, it will vary with the size of the still and the percentage of ammonia in the weak liquor. A test with a 40-inch diameter still showed 21 pounds steam per pound of ammonia, and a report from Rixdorf, of Germany, states the average of a year's make, from 9,500 tons of coal, to be 1.6 coal for 1 ammonia. A 36-inch still at a gas works in Wisconsin used 4 tons of breeze during a 48 hours' run, making about 1,000 pounds of ammonia. At the same time and place 700 pounds burned lime was used to liberate the fixed ammonia.

Some Electrical Fire Hazards.

By Mr. Washington Devereux.

The subject that directs our attention this evening is one of vast importance to all, regardless of whether they be the consumer or non-consumer, the lighting or power company, the telephone or telegraph company, or the insurance companies.

Not much has been written upon this subject excepting by the insurance fraternity, for, while the facts remain the same, the effect of stating the true condition of affairs would have discouraged many in the use of electricity as an illuminant or for power purposes. To-day the general public is better acquainted with the facilities afforded by the use of electricity and with the dangers involved in its abuse, and, in consequence, they assist materially in the advancement of this source of power. That this assistance may become of more value is most heartily looked for and an examination of some of the causes that may create a fire from electricity may be the means of educating the public to this desired state. We may reduce the causes to:

1. Short circuit, in which the current is impeded in its desired course.
2. A leak, in which the current flows over or takes an undesirable course.
3. The contact with parts which have become heated by the flow of current, which may be at the time of heating a part of the circuit from the source of the supply to the consuming device.

The first cause, a short circuit, may be defined as a circuit of low resistance. This definition is not self-explanatory, for we may have a low resistance, which resistance could be made up of any number of resistance devices connected in multiple and doing useful work, the joint resistance of which may be very low.

The second cause, a leak, may be of high or of a comparatively low resistance. In either case it must be treated as an undesirable consuming device attended with its many dangers.

The third cause does not require any further explanation, for our daily experience with heat from any cause, and its effect upon bodies in contact with it, is the best demonstration of its danger.

Before examining the causes denoted, it may be well to bear in mind that any one of the causes may occur in any part of the circuit, which circuit involves any part of the generation, the transmission, or the translating of electric current.

The most simple case of a short circuit is that in which two wires of the same circuit and of opposite polarity, and between which a difference of potential exists, are brought into electrical contact. The result of such a contact is to allow an amount of current to flow sufficient to melt the fuse or to open a protecting device, or to heat the wire to its melting point.

It may be readily seen that a short circuit can occur in any part of a circuit, which circuit has been defined, irrespective of the difference of potential.

Another case is that in which a chain hanging from a crane made contact with the exposed live parts of a trolley power generator, causing a short circuit. The heat attending the short circuit was sufficient to melt the metal, which dropped to the floor, resulting in quite a disastrous fire. From the same cause we find the destruction of motors, irrespective of the source of supply or of the nature of the work to which they may be applied; of incandescent lamps due to the crossing of the filaments, the connecting wires, or the base of the lamp; of arc lamps on low potential systems; of sockets, switches, cut-outs, flexible cords, wiring on gas and electric fixtures, each of which may result directly in a fire.

The second cause, that of a leak, is possibly one of the most treacherous factors we have to contend with.

A leak, resulting in the flow of a current, may be so small that it will not affect the smallest protective device on the line. Its work is slow and in almost every case destructive, and does not necessarily appreciably heat the wire unless the line is excessively fused, in which case there may be an excessive flow of current.

This leak can exist at any point, and is usually due to dampness. It is difficult to test for and locate, as its condition varies with atmospheric changes or other causes that may vary the moisture which may exist on any insulating material.

When due to dampness, this leak is the result of a combined electrochemical action, which we know is attended with more or less heat.

The process of electrochemical decomposition may be more correctly termed electrolysis. Unless interrupted, its ultimate end is to destroy the insulating properties of substances that are in contact.

A case in point is that of the charring of wood molding directly the result of dampness, in which there is a surface conduction of current. This will eventually change the wood into a more combustible substance —that of charcoal. Being a comparatively good conductor of electricity, the current flowing may be sufficient to heat and ignite the charcoal, or it may be ignited by an arc.

The electrolytic action affects metallic substances wherever encountered. In many cases the so-called verdigris, a direct result of electrolysis, covers switchboards, switch bases and cutouts, rendering this otherwise insulating surface a conductor of electricity, further increasing the action and heating the affected parts. Sufficient heat may and has been developed to rupture the insulating base, consisting as it may of either slate, porcelain or marble, and permitting the actual contact of the switch blades or fuse lugs resulting in a short circuit.

In another instance electrolytic action set in between conductors incased in an iron conduit (unlined) and was carried to such an extent that the insulation broke down, causing a short circuit, welding the conductors and puncturing the conduit.

Grounding will eventually produce the same condition of affairs. By grounding is meant that there is an electrical connection between a conductor and the earth, or between the conductor and some conducting material that may be partially insulated from the earth. In either case, intended or not, there is a difference of potential between the insulated conductor and the earth, or between the partially insulated material and the earth. The accidental grounding of the other side of the circuit will produce a leak or short circuit, inviting an undesirable condition.

In one instance, a frame house, supplied with gas, was wired and connected for the supply of electric current. A flexible drop cord was hung in front of a bureau between two windows. A gas bracket was located beside one window, the pipes to supply the brackets being run under the window, but inside the framework, a joint in the pipe being made directly under the window. A fire occurred and an examination justified the following conclusions: The flexible cord had been hung over the gas bracket; the handling of both the cord and the bracket had resulted in the removal of some of the insulation of the cord, thus making an electrical connection between the gas pipe and the bare wire;

the current was carried to the gas pipe joint; the contact, being electrically poor, created an arc, punctured the pipe and ignited the gas. Another example is a case of a poorly grounded conduit system in which either positive or negative wires become grounded to the iron conduit, and in which event the conduit becomes of the same polarity as the grounded wire, and there will then be a difference of potential between the grounded pipe and the earth, or the other polarity of the system, ever ready to close the circuit, creating a cross or short circuit. The same condition is possible in metal ceiling construction.

On very large systems, as, for example, a 3-wire underground system supplying current over a large district, it is impossible to maintain a perfect freedom from grounds, the leakage to earth being through the insulation and the tubes, the service, junction, and feeder boxes. On such a system it is practically impossible to make use of a ground detector, on account of this leak being general. Such a ground or leak practically connects every underground pipe service to this system.

In connection with the supply of current to combination gas and electric fixtures, where it becomes necessary to attach the wires to the gas pipes, it would be dangerous, if not disastrous, if the insulation should break down, piercing the gas pipe and igniting the escaping gas. It may be well to note here that trolley systems have a ground return and maintain a difference of potential of about 550 volts between the trolley wire and the rail.

The high tension series arc light system, whether underground or overhead, furnishing a constant current of 9.75 amperes, the potential of which may vary from 500 to 6,500 volts, is a source of danger, for, in the event of two grounds, the arc produced may be a powerful one, and, should a break occur in the line, an intense and a long arc may be obtained at that point.

If the primary and secondary coils of a transformer come into contact electrically, the high voltage primary current would flow to the secondary system, which is entirely unsuited to such high pressure.

There is still another hazard in connection with overhead lines—that of discarded wires. These wires, no longer in service, but retained in order to maintain the right of way, cross and lie upon roofs of buildings or hang in an unsafe condition from a structure, and in some cases, such as telephone, telegraph and call wires, are actually connected to gas and water pipes in tenanted or unoccupied buildings. The other end of these discarded wires may be hanging promiscuously and, possibly, due to corrosion or rusting of the wire or its holdings, fall and cross wires carrying current at a high or low voltage. In consequence, the current is carried through the discarded wires to ground, whether it be gas or water pipes, metal roofs, cornices, or awnings, and may be sufficient to melt the wire or cause an arc at some comparatively high resistance point, creating a most favorable condition for far more serious trouble.

The third cause is that in which an inflammable material is permitted to come into contact with parts of a circuit that have become heated. This cause may be divided into two classes: that in which insulation is the material and that in which a material exists, but adds nothing to the benefit of the circuit. It is obvious that there is no necessity for these distinctions, for the result is ultimately the same and will be treated as such.

In the manufacture and distribution of electrical energy there is a loss by heating due to the fact that all substances have a resistance which has to be overcome and which represents a loss in energy which is substantially all transformed into heat. The heat which is produced in a wire only depends on the number of watts expended electrically by the current in overcoming the resistance of the wire, which resistance varies with different materials, and goes to raising the temperature of the conductor and indirectly that of the surrounding bodies; and this rise continues until the rate at which heat is lost equals that at which it is generated; then the temperature becomes constant. It is obvious, therefore, that an electrical conductor is only capable of carrying a certain current with a given elevation of temperature, and, practically, the allowable temperature is limited by consideration of injury to insulation and the danger of fire.

The temperature elevation of a wire for a given current strength depends upon its resistance, diameter, covering and its surroundings. A copper wire carefully insulated by a thin coating of waterproof material and placed in still water is usually kept comparatively cool, owing to the rapid conduction of heat through the insulated cover into the water.

The same wire, carrying the same current, but suspended in air instead of being immersed in water, will usually attain a considerably higher temperature, as still air does not carry away heat from the surface of the wire so effectively as still water. For the same reason a wire buried in the ground will, in almost all cases, be found to be cooler than where supported in the air. A covering of, say, cotton, rubber or other electrical non-conductor will, up to a certain thickness, serve to cool the wire by increasing its surface.

The same heating conditions would apply to switches, switch or fuse lugs, bus-bars, commutators, and, in fact, to any current carrying parts of a circuit, and it is, therefore, necessary that they be sufficiently heavy to carry the required current without undue heating.

Heating may be the result of insufficient contact surface and the tendency in all cases is to increase the temperature to a dangerous point or to melt and ignite the insulation of an inflammable nature, such as rubber and cotton. It is necessary, therefore, that the carrying capacity of current carrying parts and of contacts shall be limited.

Poor connections at fuse blocks may produce heat enough to cause the fuses to melt when there is really no trouble elsewhere on the circuit. This may occur when the fuse blocks have too little contact surface at the connection points to properly carry the current, or when the contact surface is not secure, in which case arcing occurs, pitting the surfaces and intensifying poor contact.

Other sources of fire may be the contact of an incandescent lamp with inflammable material, such as cotton, paper, wood, celluloid goods, etc.; the melting of fuses, the breaking down of insulation, sparking from electrolysis, or short circuits in places impregnated with inflammable gases, such as benzine, naphtha, ether, hydrogen, gasoline and many others of explosive nature; also in any class of manufacture where vegetable material is distributed through the atmosphere in the form of dust extra precautions are absolutely necessary, the least flash or arc being sufficient to cause an explosion. While the electric light is the safest light in places of this character, the wires should be placed in iron conduit, there should be a vapor proof globe over the lamp, and cut-out and switch should be located at a safe distance.

Candy factories, sugar refineries, flour mills, breweries, saw mills, and others of like hazardous nature may be considered in this category; also textile mills, where there is an accumulation of the particles of stock that is carded out, which particles, owing to their extreme lightness, fill the air in the room, and, settling, completely cover everything with an inflammable material usually known as "fly," which is a fine dust of vegetable matter. In this condition the dust may be ignited by the blowing of a fuse or similar accident.

It has been contended that electric light stations burn more rapidly than buildings of the same construction, but used for other purposes, and it has been supposed by some that this is due to the saturation of the walls, floors, and its entire structure with electricity. The atmosphere in central stations supplying light or power is impregnated with ozone, the result of electrostatic discharge from belts and sparking brushes, and intensified by the more favorable conditions of heat and dryness necessary to the proper operation of a station. That ozone adds to the heat and rapidity of a fire once started is evident and is a subject for further investigation.

It is quite apparent that the same state may be created in manufacturing establishments where favorable conditions exist.

Static electricity has been justly considered as a cause of fire. Combustible gases and vegetable dust may become ignited by the spark resulting from the static discharge from belts.

Electrical excitement manifested by sparks and shocks is so common in manufacturing institutions as to cause no comment. In explosions that have occurred in breweries, dyeing establishments, oil-cloth works, printing offices, chemical works, distilleries, flour mills and manufactories of similar character the cause has been traced to electric sparking or the friction from static electricity.

It will be noted from the remarks made in this paper that electricity is treated as a source of heat, and, as such, is classed as a fire hazard, and it is fair to say that it presents to us a most dangerous and powerful factor in that respect if permitted to be neglected.

That the situation is not worse is due, primarily, to the fire underwriters, who early realized the importance of restricting indiscriminate methods of construction in order that the greatest possible immunity from fires may be secured.

With these facts in mind the National Electric Code was compiled and published by the American Institute of Architects, American Institute of Electric Engineers, American Society of Mechanical Engineers, American Street Railway Association, Factory Mutual Fire Insurance Companies, National Association of Fire Engineers, National Board of Fire Underwriters, National Electric Light Association and the Underwriters' National Electric Association, a compilation most worthy of the honorable and learned bodies referred to. It provides for almost all emergencies, yet circumstances may, and do, arise, where, from a

possible misinterpretation or the unusual conditions present, the code does not seem to apply.

In applying the code it is very evident that care must be taken in the proper discrimination of the hazard and to apply that electrical system which will be less apt to enhance the hazard.

A system which would be comparatively safe to introduce in a department store would fall and break down in breweries, dye houses, bath houses and places of similar character, due to dampness; and in chemical works, starch and sugar works, textile mills, paper mills, gunpowder works, fur tanneries, coal mines and flour mills, due to danger of ignition or explosion of the dust by electrical sparking.

Extra precaution should be taken in regard to the use of rubber-covered wire in warm rooms, such as engine and boiler rooms, hot rooms in bath houses, and in drying rooms. The same precaution should be taken in regard to the use of any wire, other than rubber-covered, in damp places. Thus, it will be seen that, as conditions vary, one quality of insulation would be advisable in one location and would be absolutely unsatisfactory in another location.

Generators, motors, switchboards, resistance boxes and equalizers would be unsafely placed if located in damp rooms. Transformers would be dangerously placed if inside buildings where the oil or smoke from the burning out of the coils or the boiling over of the oil could do harm.

It may be correctly judged that, in the installing of electric wiring supplying incandescent or arc lamps, motors, heaters or other apparatus, supreme care must be taken to avoid, wherever possible, gas pipes, water pipes, the space under the bath rooms and water tanks, and general metallic construction, including metal awnings, metal ceilings, iron beams, cornices, awning frames and signs.

The secret of long-distance transmission lies in the successful employment of very high voltages, and, regardless of the character of the current employed, the difficulties of insulation confront us. It is important that the line as a whole must be insulated against direct earth connection or short-circuit in underground service, and grounds or short-circuits if the line is an aerial one.

The quality of insulators is another important consideration, owing to surface leakage or puncture. Surface leakage is more to be feared, as it can never be depended upon, being a function of moisture from rain, wet snow or fog, and drifting dust, which is difficult, if not impossible, to provide against, and which varies with the location.

High potential circuits are also objectionable in any location where telephone, telegraph, signal systems and similar circuits are in proximity to them.

Extra attention must be given to an installation supplied by secondary alternating currents, in order to reduce the hazard and provide for any defects that may result from the breaking down of insulation of primary wires.

Overhead wires should be protected by lightning arresters, the proper distribution of which depends on local conditions.

The great problem is how to secure safety, and this may be answered: By the proper methods of construction, using only high grade material.

Evidences of the lack of knowledge on electrical subjects are quite apparent. Nails and screws driven into electric light molding, wires in contact with foreign metallic objects, fuses uncovered so that molten metal may fly about among inflammable material, and conductors so overloaded as to be perceptibly hot.

The fire hazard should be always carefully considered in an electrical installation. A system of electric wiring may be ideal from an engineering point of view, and yet as a fire hazard would be most dangerous.

While the operation of electrical apparatus is burdened with many dangers under some conditions, the reverse may be said when the equipment is installed by skilled wiremen guided by experienced engineers and the National Electric Code carefully applied; and it is essential, when alterations or repairs are necessary, that, as a continual safeguard, due notifications be given to the local Board of Fire Underwriters. Under these conditions electricity is as safe as any source of power and the safest source of light known to mankind.

THE proprietors of the Natick (Mass.) Gas Company have authorized the Messrs. Waldo Brothers, of Boston, to install a bench of 6's on their plant, which increase in generating capacity will require an addition to the retort house of about 20 feet. The ironwork on the job will be furnished by the Isbell-Porter Company, of this city. Of course, the work was planned by and will be carried out under the direction of the Natick Company's Superintendent, Mr. N. O. Goulding.

A Few Photometric Tests of Incandescent Mantles in Commercial Use.

[A paper read by Mr. R. C. CORNISH, at the Second Annual Meeting of the Wisconsin Gas Association.]

It is not my purpose to enter into the theoretical questions involved in a series of tests of incandescent gas mantles, but rather to give the results of a series of tests made on mantles selected at random from stock.

At the meeting of the Michigan Gas Association, held at Grand Rapids, Michigan, February 20th and 21st, 1901, Mr. Herman Russell read a paper on this subject. The material for this paper was worked up by Mr. Russell and Mr. Alfred H. White.

In this paper they arrived at several conclusions with regard to the manner of making these tests, which I have checked over for my own satisfaction. These conclusions were as follows: Use constant pressure of 20-10 at burner. It is found that there is little increase in efficiency with higher pressure. This pressure will also be a fair average pressure at the consumer's burner. Second; keep air constant and vary gas supply to obtain maximum illumination. With smoked glasses this can be obtained with very little experiment.

I tested the following mantles: Racine, Peerless, Phœnix, Yusea, Astoria, Superior, Gasco, Brighton, Apollo, Welsbach, Lindsay and Fire King. Three mantles of each kind were tested, but in some cases the average of only two was taken, due to breakage. Mantles were tested without chimney, with 6 and with 8-inch chimneys. The burner used was a large tube burner having needle valve for regulating gas supply. This was taken from stock. The photometer used was a 250 m.m. bar, with contrast sightbox, pivoted so that it could be reversed, and having a wet meter for measuring the gas consumed. Pressure was regulated with a Connelly governor. The Edgerton standard was used. This was tested each time before and after making a series of tests with a Hefner lamp which had been previously tested with candles.

I had intended to make calorific tests of the gas at the same time with photometric tests, but did not have an opportunity. However, I am satisfied that the gas was fairly uniform during the period of tests, as the gas engine which operates our lighting dynamo gave uniform results. During this time the candle power of a 5-foot Argand was 17 candles and the specific gravity of the gas was .43.

I have given my results in the form of a table expressing the names of the mantles by figures. There is an average increase of 45 per cent. in candle power per cubic foot of gas, using a 6-inch chimney over no chimney, and 8.7 per cent. with an 8-inch chimney over 6-inch chimney. Numbers 4, 8, 9 and 10 gave best results, while number 3 gave good results with chimneys, and is a good average mantle.

	Without Chimney.			6-Inch Chimney.			8-Inch Chimney.		
No.	C. P.	Gas.	C. P. per Cubic Feet.	C. P.	Gas.	C. P. per Cubic Feet.	C. P.	Gas.	C. P. per Cubic Feet.
1	40.4	3.68	11.03	58.2	4.16	12.9	66.3	4.43	14.95
2	34.6	3.95	8.74	49.7	4.75	10.45	61.9	4.87	12.73
3	33.3	3.48	9.6	63.8	3.83	16.7	72.8	4.36	16.8
4	47.2	3.42	13.72	69.1	4.05	17.32	82.5	4.45	18.8
5	28.9	3.78	7.64	45.0	4.33	10.65	55.52	4.80	11.56
6	38.0	3.62	10.5	50.8	3.78	13.67	61.8	4.08	15.23
7	45.1	3.59	12.55	66.4	4.03	16.58	77.6	4.44	17.2
8	43.6	3.66	12.0	71.9	4.73	14.88	87.2	4.97	17.28
9	47.2	3.55	13.3	75.5	3.86	19.5	84.6	4.32	19.63
10	51.2	3.65	14.15	77.8	4.08	19.4	89.6	4.43	20.4
11	36.4	3.75	9.70	47.6	4.21	11.3	56.8	4.65	12.3
12	34.5	3.76	9.16	48.4	4.19	11.63	65.1	4.88	13.35

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, Feb. 10th, 1903.

Inclined Retorts and the Quality of Coal.—The Accounts for the Last Half Year.—The Inverted Gas Light.

Mr. Brown's paper, on "Why Milwaukee Did Not Adopt Inclined Retorts," as read at the recent meeting of the American Gas Light Association, has attracted some considerable attention in England, and especially that part of it which states that the South Metropolitan Gas Company, of London, had decided to dismantle their large installation of inclined retorts at the Old Kent Road works, and to substitute horizontal retorts worked by machinery for the same. The magnitude of the change is evident from the fact that the installation comprises 15

beds of 8's and cost £14,000. The *Gas World* was so far exercised as to interview the Chief Engineer of the Company, Mr. C. C. Carpenter, and that gentleman at once admitted the soft impeachment, and added that the work of demolition was already in progress. With equal frankness he explained that they had to depend upon the Durham coal fields for their supply of staple material, and they had found from experience that practically about one-half of the coal supplied could not be satisfactorily worked in inclined retorts. They could readily arrange to charge in an even layer, but the difficulty was that slipping took place in the retort after carbonizing had commenced. They did not at present contemplate the abandonment of the system at their other two works where it had been adopted, because these were comparatively small, and they expected to be able to select suitable coal for them. The slipping was associated with the physical condition of the coal, and when once they found that a cargo from a certain pit possessed this failing they knew that every cargo from that pit would be equally unsatisfactory. It need not necessarily be a bad gas coal, but proper results could not be obtained from it in the inclined retorts. The actual daily working expenses with an inclined installation were slightly less than those with horizontal retorts, but against this the first cost and also the repair and maintenance were very heavy. Retorts under fire always tended to sag and get out of level at the middle portions, and this was a more serious matter with the inclined than with the horizontals, which rarely sank to such an extent as to interfere with the working, even when machinery was used. But a very slight settlement was sufficient to upset the inclines, and the consequence was that while the practical working life of the horizontals was 2,400 days, the inclines could not be worked with economical efficiency for more than 1,200 to 1,600 days, and after a very short time the spent charge required to be assisted or tickled, not only at the bottom but also at the top end of the retort, to insure the satisfactory discharge of the coke. And Mr. Carpenter finishes up with a sort of parting kick in the shape of an assurance that no one, from the superintendent to the stoker, will regret the departure of the slopers from the Old Kent Road.

Mr. Carpenter deserves the special thanks of the profession at large for so plainly setting forth his experiences. Although this is exactly the kind of information that is likely to be useful to gas engineers, it is also just the sort that is conspicuously absent from lists, catalogues and the special pleading of "our representative." It is easy to get at the good points and advantages, but very difficult to get at the practical defects, and it is not everyone who is in a position to buy experience at a cost of £14,000. Such a proceeding would cripple an ordinary provincial works for a lifetime. The publication of the interview has elicited a kind of rejoinder from "A well-known gas engineer" who does not further disclose his identity, and which practically admits the correctness of Mr. Carpenter's statements. He says that although any fine, dusty coal is liable to slip, the defect can be remedied by slightly damping it, and that the many advantages of the system far outweigh this one drawback, if it is a drawback. He goes on to argue that it may be a blessing in disguise. A consignment of coal was sorted and analyzed with the following results: Large coal, 11,200 cubic feet of 16½-candle gas per ton; mixed lumps and dust, 10,500 cubic feet of 12½-candle; fine dust, 8,500 cubic feet of 12-candle gas. If he had been using horizontal retorts he might have accepted the consignment without question, but as it was he demanded compensation in respect to the large amount of dust. From which it is contended that inclined retort users will stand out for better coal and see that they get it, and that the contractors will have to improve the quality of their consignments.

All of this is very poor logic, and the apostles of the inclined system will need better arguments to carry conviction in its favor. Hotspur could "Call spirits from the vasty deep," but was asked whether they would come when they were called, and similarly it is one thing to demand compensation and another thing to get it. Many gas companies find it advantageous to buy small, unscreened, through and through, or brush coal, containing a considerable portion of small, and could not claim compensation without putting clauses in the contract that would have the effect of raising the price in the first place. Anything like a general demand for improved quality of consignment would be met by a counter demand for a higher price. No coal merchant would accept a clause limiting the percentage of small, or guaranteeing satisfactory working in the incline without a corresponding consideration. The hapless individuals who by force of circumstances, or preference, continue to use horizontals, do not need a £14,000 set of inclines in order to find out whether the coal is up to the mark. Most of them possess station meters and photometers, and are in the habit of checking the quantity and quality of their products, and if these turn out to be deficient to any important extent, are in quite as good a position in regard to compensation as the user of inclines. So long as the quality and yield are right they do not need to go to the expense of sorting out the coal, and if a consignment is sent that on inspection shows the presence of even unreasonable percentage of dust, or a falling off to the extent of 500 or 1,000 cubic feet per ton in respect to yield of gas, they are not likely to accept it without question. One may also ask whether the results obtained after separation into large, medium and dust are a fair criterion of those obtained by working the mixture? The fine dust, for example, taken by itself, would lay very close and heavy in the retort. But when worked as received, with two or three times its bulk of lump, the carbonizing conditions are entirely changed. The question of getting full value in return for the expenditure on coal is a commercial one, entirely distinct from the angle at which it may be carbonized, and if the inclined is more nice in respect to dust and small than the horizontal, the practical effect of its extended adoption will be to put a premium on screened coal. One cannot criticize the damping remedy in the absence of practical experience, but it will scarcely command the approval of practical gas makers. If the damping is to be sufficient to have any effect in binding the coal, it must also be sufficient to reduce the temperature of the retort and affect the working results. What is really wanted is a retort inclined the other way, towards the utilization of cheap, small coal, to the enlargement of the choice of material at command, rather than to increasing the demand for special brands of screened coal, which already command a high price. Or failing that, a process for dealing satisfactorily with the small and dust, so that the coal on delivery would be passed over a screen, and thus made to furnish suitable material for the inclined retorts. Some kinds of soft coal, otherwise excellent gas works material, undergo considerable disintegration in transit. No doubt many points can be urged in favor of the sloper by those who, like Mr. Carpenter, can speak from practical experience, but after reading the above communications it is impossible to avoid the conclusion that the advisability or otherwise of adopting it must turn to some extent upon the relative cost of screened and unscreened coal, the kinds of coal available and the distance from the collieries.

The accounts of gas companies for the half-year ended Dec. 31, last, as now being issued, show on the whole a fairly satisfactory state of affairs. As already indicated the very mild season has not been in favor of sales either of gas or of coke. But against this the price of coal, while by no means cheap, shows a decided improvement on the rates that have been prevalent during the last 2 years, and it has been possible to earn full dividends. The development of the slot meter department still continues, and in some instances tends to outstrip the ordinary business so far as numbers are concerned. The South Metropolitan Gas Company, of London, for example, report that out of a total of nearly 250,000 meters in use, 139,000 are slot meters. And the advantage of this line of business as regards day consumption is evident from the fact that, out of a total of about 172,000 gas cookers on hire, over 112,000 are on the slot system, from which it is evident that the introduction of this department has had an important effect as regards the extension of the use of gas for cooking purposes. In addition the South Metropolitan have 15,664 gas fires on hire. This Company report that during the first 3 months of the half-year there was the usual satisfactory increase in the consumption of gas, but this was checked by the mild and open weather of the second 3 months, with the result that the increase for the half-year was reduced to 2½ per cent. This, if unsatisfactory in one sense, is of importance in connection with the fact that the Company have reduced their standard of illuminating power, from 16 to 14-candle gas. It has been suggested that this alteration, notwithstanding the fact that it was attended by a reduction of 2d. per 1,000 cubic feet in price, would be of no real advantage to consumers, because they would be compelled to use proportionately more gas. But the proof of the pudding is in the eating, and it is evident that they have been gainers by the change. They have not used more gas, and they are profiting to the extent of nearly £100,000 per annum by the reduction in price. On this head it may be remarked that the London County Council have applied to Parliament for an order that the Gas Light and Coke Company shall accept similar conditions, viz., a reduction of the standard from 16 to 14-candles with a corresponding reduction of 2d. per 1,000 cubic feet in price. Strange to say the Gas Light and Coke Company have decided to oppose this measure. The way in which it is drafted may possibly afford excellent reason for such procedure, but the principle of a lower photometrical standard is equally to the advantage of the Company as to the consumer. I have already set forth the principal points in its favor, so it is not necessary to repeat them. But whether the Gas Light and Coke Company like it or not the movement is bound to spread. The ex-

perience of the South Metropolitan proves that the consumer has no ground for opposing it. He wants a cheap gas of good heating power, rather than one that will pass a high photometrical standard in the official testing room. Already several processes are in the air whereby coal can be treated so as to yield a larger quantity of proportionately poorer gas, and the accounts show that the South Metropolitan have averaged during the half-year a make of 10,577 cubic feet per ton and an actual sale of 9,762 cubic feet, which is a considerable advance on the corresponding statistics for previous years. The other London Gas Company, the Commercial, have adopted the innovation and accordingly reduced the price of gas 2d. per 1,000 cubic feet, as from the beginning of the year.

For some time past endeavors have been in progress with the object of perfecting the inverted system of incandescent lighting, in which the flame strikes downward instead of upwards, and these appear likely to be crowned with success. Anyone who has studied the emission of light from the ordinary mantle, starting at the horizontal and advancing upwards by intervals of 10° to the vertical, will appreciate the advantage gained in practice by inverting the light, which means reversing the diagram as above obtained. A large portion of the light tends to strike upward, and in street lighting a marked improvement is, therefore, obtained by the use of a white porcelain or enameled deflector fixed in the head of the lantern. Such an arrangement cannot well be adopted for interior lighting, but in ordinary living rooms the white ceiling forms an efficient substitute for the deflector. This, however, is not always available. Many public rooms and places of worship have open, vaulted or decorated ceilings which may be effective from an architectural point of view, but are in no way suited to act as deflectors of artificial light. For these the inverted mantle is especially suited. In the lighting of shop windows, the illumination of workshop benches and many other purposes, a direct is more efficient and preferable to a deflected light; and especially in regard to what is usually known as decorative lighting, small inverted burners are very acceptable. I have recently seen some very effective examples of this class of burner, in which the light is perfectly steady and the flame noiseless, and all who are on the lookout for the latest developments in gas lighting will do well to direct their attention towards the inverted system.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. Henry I. Lea has been appointed Assistant Engineer to the Western Gas Construction Company.

Write to the H. Mueller Manufacturing Company, of Decatur, Ills., for a set of the Company's "card souvenirs."

The recent pronounced advance in the shares of the Laclede Gas Company, of St. Louis, Mo., is accounted for by some of the knowing ones on the belief that the long talked of amalgamation of the forces of the Laclede Company with those of the Missouri-Edison Electric Company is close at hand.

The following decision by the Massachusetts Board of Gas and Electric Light Commissioners, in respect of a revision, by the Board of Trustees, Municipal Light Commission, of Wakefield, Mass., of gas and electric light rates in that borough, is self explanatory:

"To the Municipal Light Board, Wakefield, Mass.: Gentlemen—We have the honor to acknowledge receipt of your petition for the approval of certain prices for the gas and electricity supplied by the town of Wakefield to the inhabitants. The following facts seem to us of importance in the consideration of this request. The present price for gas is $2 per 1,000, with a discount for prompt payment of 10 per cent. and 20 per cent. when used through a separate meter, making the price $1.80 and $1.60. Electric lights are supplied at practically 20 cents a kilowatt hour. These prices were approved by this Board in 1894 in response to a petition of the Municipal Light Board after a public hearing, and when the schedule proposed had been formally approved at a regularly called meeting of the town, after a full explanation of the reasons therefor. It was well understood at this time that these rates were not sufficient to provide for the interest and depreciation charges which the law requires to be included in computing the cost. It was equally clear that a price to include this cost would be prohibitive. It is now desired to so increase the discount for prompt payment as to make the net price for gas, whether used for lighting or fuel, not more than $1.50 per 1,000, and to make a discount from the present prices for electricity of 10 per cent., but only for prompt payment of bills. Under the prices now in effect, the output of gas has more than doubled, thereby substantially reducing the interest and depreciation charges per 1,000. For the year ending June 30, 1902, the gas income was more than enough to pay the operating expenses and interest charges of the gas department, but not enough to pay also the depreciation charges named in the law. It is urged that by a reduction to $1.50 the output will be increased with a corresponding diminution in the charge per 1,000 feet for interest and depreciation, as well as for management and distribution, and that the income might thereby more nearly return these charges than at the prices to-day. There is much to support this view. The proposal of the Municipal Light Board, under the conditions in Wakefield, has many of the elements of a fair and reasonable business proposition. The finance committee of the town have approved it and urged its adoption. We believe it would be approved by the town and that this Board should not refuse to allow the experiment to be tried. The proposition to reduce the prices of electricity 10 per cent. for prompt payment of bills, and only upon that condition, is one in common practice. It facilitates the collection of accounts and minimizes the bad debts. As a business proposition it is likely to prove to advantage to the plant. In view of these facts the board has

"*Voted*, That, until otherwise ordered, this Board hereby approves of the sale by the town of Wakefield to its inhabitants of gas at the net price of $1.50 per 1,000 feet, and of electricity at a discount, for prompt payment only, of 10 per cent. from the prices for electric light and power heretofore approved by this Board."

At the annual meeting of the Salem (Mass.) Gas Light Company the Directors elected were: H. A. Hale, J. H. Smith, C. F. Prichard, S. W. Winslow and A. W. Rogers. Mr. B. W. Sluman was named to succeed himself as Treasurer. The Directors were empowered to petition the Board of Gas and Electric Light Commissioners for the right to issue additional capital in the sum of $50,000.

The Board of Aldermen, of Poughkeepsie, N. Y., have instructed Assemblyman F. G. Landon to introduce in the State Assembly a bill specifying that "No corporation, association, company, copartnership or persons shall charge or receive for illuminating gas in the city of Poughkeepsie a sum to exceed $1 per 1,000 cubic feet." It is also stipulated that the minimum candle power of gas distributed in the city shall be 22.

We understand that the plant and properties of the Natchez (Miss.) Gas and Electric Light Company have been sold to a syndicate headed by Mr. A. R Dufour, of New Orleans, La.

About as mean a strike as was ever brought before the New York Legislature is a bill recently introduced by Senator Malby, which decrees that, in cities having a population of over 12,000 and not more than 13,000, the price of gas shall not exceed $1.50 for illuminating use and $1.25 for cooking, heating and power purposes. This measure can only apply to the city of Ogdensburg.

At the annual meeting of the Kalamazoo (Mich.) Gas Company the following officers were chosen: Directors, H. D. Walbridge, John J. Knight, Edward Woodbury, C. A. Peck, Ira A. Ransom, H. B. Osborne, J. W. Thompson, Hutson B. Colman and F. W. Blowers; President, H. D. Walbridge; Vice-President, John J. Knight; Secretary and General Manager, Frank W. Blowers; Treasurer, David H. Haines.

The Directors of the Washington (D. C.) Gas Light Company have perfected the following executive management: President, John R. McLean; Secretary, Wm. B. Orme; Treasurer, John C. Poor; Assistant Secretary, Sanford M. Whitwell.

The reorganization of the well-known gas motor concern of Koerting Brothers, of Hanover, Germany, by the newly formed German Electric Works' Trust, will be completed shortly. The new combination will have a capital of $75,000,000.

The Saginaw City (Mich.) Gas Company's first mortgage 5's, to the amount of $100,000 are offered at 101 and accrued interest by Messrs. King, Hodenpyl & Company, of Chicago.

The City Council of Minneapolis, Minn., have adopted a resolution providing for the appointment of arbitrators to consider and fix a gas

rate there "satisfactory to the city and to the Council." That will be a difficult task.

THE Edison Electric Illuminating Company, of Boston, has secured an option for control in the shares of the Chelsea (Mass.) Gas Company.

A CORRESPONDENT incloses the following, under date of the 21st inst.: "The St. Paul (Minn.) Gas Light Company was successful in its contention with Matilda E. Skoglund, under a decision of the State Supreme Court handed down some days ago. The appellant was a boarder in a private family. A representative of the Gas Company, at the landlady's request, visited the house to inspect the gas pipes and turned off the gas while making repairs. The appellant went to sleep in a room with the gas burning and did not know it was turned off. When the gas was turned on again she inhaled it and claimed serious injury to her health. Justice Lewis, in his opinion, says: 'Frost having reduced the gas pressure in pipes supplying a private boarding house, a representative of the Gas Company was sent in response to a notice of the fact, and, upon his arrival, notified the landlady that it would be necessary to turn off the gas while making repairs. The landlady, with the assistance of a boarder, attempted to turn off the gas jets throughout the house, but the room occupied by appellant was overlooked, and she had no notice of the fact that the gas was to be turned off, and, having fallen asleep while the gas was lighted, was injured by inhaling the escaping gas when it was turned on again. Held, the Gas Company was not guilty of negligence in failing to notify appellant that the gas would be turned off, or in failing to see that all of the gas jets in the house were turned off when the gas was turned on again.'"

MR. G. E. PETTIBONE, Manager of the Municipal gas and electric light works of Westfield, has submitted his report for the year 1902, and it shows that the plant has been most successful the past year. The receipts from both departments were $51,929, and the expenditures $45,819. The excess of receipts over expenditures was $6,110. The profits of the gas department were $14,025, and of the electric department $3,876, making a total of $17,586. New construction is included in figuring the profits for the year. The total number of gas consumers is 731, an increase of 59. The electric light consumers increased from 74 to 88. The amount of gas made in the 12 months was 20,050,300 feet, an inincrease of fully 2,000,000 feet over the previous year. The average candle power of the gas was 17.77. The net profit for the year in the departments was 10.08 per cent., but with the depreciations deducted was but 6.4 per cent.

WR. WILLIAM H. WARD, for many years Superintendent of the Easton (Pa.) Company, died, the morning of the 20th ult., in Easton, under peculiarly distressing circumstances.

THE Pittsfield (Mass.) Coal Gas Company is preparing to extend its mains to the outlying village of Dalton.

NEGOTIATIONS are under way for the merging of the interests of the Steelton (Pa.) and the Middletown (Pa.) Gas Companies. Both properties are controlled by Mr. A. C. Sickels and his friends.

MR. HENRY C. WHIPPLE, Superintendent of the Rockford (Ills.) American Gas Light and Coke Company, recently issued the following notice: "After April 1, 1903, the price of gas in this city will be reduced to $1.25 per 1,000 cubic feet to all consumers. To those who pay their gas bills on or before the 10th day of the month in which they are due a discount of 10 cents per 1,000 cubic feet will be allowed—making the net rate $1.15 per 1,000 cubic feet to those who pay promptly. No gas bill will be made out for less than 50 cents. Positively no discount will be allowed after the 10th of the month. Bills may be paid at the Manufacturers Bank on the east side, and at our office on the west side. This great reduction means a serious loss to us unless a greatly increased use of gas ensues. We desire to make the service of gas as perfect as possible. To that end we need the friendly co-operation of our patrons. We are always willing to investigate complaints and remedy the fault if possible. Poor light is often caused by the use of poor burners. On application at our office new burners of the best kind will be put in free of charge. We are always willing to test your meter in your presence if desired, and without cost to you. Learn to read your meter and then you will know how the gas is used. This new price is low, and we trust it will result in a greatly increased use of gas for light, heat and power."

LAST Saturday the shareholders of the South Jersey Gas, Electric and Traction Company voted to issue a mortgage of $15,000,000, of which $8,000,000 will be used to retire existing bonds at maturity. At the meeting it was also decided to merge the following concerns: Bordentown Gas Light Company, Beverly City and Township Gas and Water Company, and the Rivershore Gas Company.

THE authorities of Newark, N. J., have concluded a contract with the Essex and Hudson Gas Company, under which the latter will supply gas for public purposes in Newark for the next five years, the agreement to date from the 1st inst. It is agreed that the Company will maintain not less than 2,000 lamps, fitted with 4-foot burners, on a lighting table of 4,000 hours, at the rate of $19 per lamp per annum; and that the rate to ordinary consumers will be $1.10 per 1,000, less 10 cents per 1,000 for prompt payment. These rates are virtually like those which have prevailed for the last 5 years.

MR. ULMAN has introduced a bill in the New York Assembly under which it is proposed to give the Bronx Gas and Electric Company the right to supply gas and electricity in New York city.

THE rotten political combination of the State of Delaware, the acknowledged head of which is J. Edward Addicks, is responsible for a bill now before the Delaware General Assemby that seeks to put the gas rate in Wilmington at 75 cents per 1,000 cubic feet. Major Edmund Mitchell, of the Wilmington Gas and Electric Company, is a prominent regular republican, and has done much to keep Addicks out of a seat in the United States Senate.

RECENT PATENTS OF INTEREST TO GAS MEN.

[*Prepared for the* JOURNAL *by* MR. ROYAL E. BURNHAM, *Solicitor of Patents and Counselor in patent causes, 833 Bond Building, Washington, D. C.*]

Acetylene Gas Generator.—Patent No. 720,976.—William E. Schofield, Long Island City, N. Y. Assignor to the Sunlight Gas Machine Company, New York, N. Y.

Alcohol Burner.—Patent No. 720,634.—John P. Steppe, Brooklyn, N. Y., assignor to Sigmund Sternau and Lionel Strassburger, New York, N. Y., copartners trading as S. Sternau & Co.

Carburetter.—Patent No. 720,968.—Archie H. Rife and James R. Carper, Dallas City, Ills.

Engine, Internal Combustion.—Patent No. 720,752.—Constantine L. Straub, Perth Amboy, N. J.

Engine, Explosive.—Patent No. 720,759.—Henry W. Tuttle, Philadelphia, Pa., assignor to John M. Scott, same place.

Engine, Explosive; Cooling Device for.—Patent No. 720,995.—Charles A. Bailey, Cromwell, Conn.

Engines, Lubricating Explosive Hydrocarbon.—Patent No. 721,057.—Anthony F. Lucas, Washington, D. C.

Gas Engine Igniter.—Patent No. 721,065.—Louis P. Mooers, Cleveland, O., Assignor, by mesne assignments, to Peerless Motor Car Company, same place.

Gas Compressor.—Stephen E. Alley, Glasgow, Scotland.

Gas Light.—Patent No. 720,805.—Hugo Herz, Chicago, Ills.

Gas Meter.—Patent No. 721,026.—John W. Culmer, Cleveland, O., assignor to Edgar M. Moore, Allegheny, Pa.

Pipe Coupling, Joint for.—Patent No. 720,655.—George F. Bard, Norwich, Conn.

Trademark No. 39,826.—Incandescent Gas Mantles—Liberty Mantle Manufacturing Company, Chicago, Ills. The word "Lightine," used since December 1, 1902.

Coal and Gas Range.—Patent No. 721,423.—Henry Chevola, New York, N. Y.

Draft Apparatus for Portable Vapor Generators.—Patent No. 721,195.—Henry Howard, Brookline, Mass.

Gas Producer.—Patent No. 721,513.—Lucien Genty, Marseilles, France. Assignor to himself and La Sociéteé Generale des Industries Economiques, Paris, France.

Locking Device for Gas Tube Connections.—Patent No. 721,577.—Isador Lindner, New York, N. Y.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

MONDAY, MARCH 2, 1903

The Market for Gas Securities.

The changing in prices for local gas shares this week was noted for eccentricity. After crossing 221 Consolidated sold down to 213½, ex dividend of 2 per cent. The closing quotations to-day (Friday) were 213½ to 213¾, ex. The howl about exorbitant gas bills now being made in one of the local sheets is exceedingly ludicrous, when one remembers how the same sheet begged the gas companies a couple of months ago, when the coal strike was on, to give them more gas. The status of the Consolidated Company is now better than ever. There was no change in Brooklyn Union.

The North American Company has at last purchased control in the Laclede Gas Company, of St. Louis, and its fortunes are to be tied up with those of the local Imperial Electric Company. It is denied that the Missouri Edison Company is concerned in the transaction. The price paid for the common was par and the dividend of 2 per cent. The Louisville Electric Light Company and the other independent local electric concern have agreed on terms for absorption. The Louisville Gas Company interests will dominate the Consolidated enterprise. Bay State is "less than one-half," Baltimore Consolidated is unchanged, and Peoples, of Chicago, is 103 bid, ex-div.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

MARCH 2.

☞All communications will receive particular attention.

☞The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	213½	213¾x
Central Union, Bonds, 5's	3,000,000	1,000	109	111
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	118	120
Metropolitan Bonds	638,000	..	108	112
Mutual	3,500,000	100	310	325
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co.. Bonds, 5's	11,000,000	1,000	112½	113
Northern Union, Bonds, 5's.	1,250,000	1,000	106	107
New York and East River Bonds 1st 5's	3,500,000	1,000	112	113
" 1st Con. 5's	1,500,000	..	109	111
Standard	5,000,000	100	131	..
Preferred	5,000,000	100	152	..
Bonds, 1st Mortgage, 5's	1,500,000	1,000	115½	118
Yonkers	299,550	500	130	.
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	220	226
" " Bonds (5's)	15 000,000	1,000	119	119½
Bay State	50,000,000	50	⅝	½
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works...	450,000	100	28	30
" 1st Mtg. 5's	509,000	1,000	93	96
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	7½	10
" " Bonds, 5's	5,256,000	1,000	75	77
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Central San Francisco	000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas & Elec. Co..	29,500,000	100	99½	100
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	101	101½
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	88¼	89¼
Preferred	3,026,500	100	107½	109
Consumers, Jersey City Bonds	600,000	1,000	103	106
Consumers, Toronto	1,700,000	50	218	225
Consolidated, Baltimore...	11,000,000	100	70½	71
Mortgage, 6's	3,600,000	..	..	115
Chesapeake, 1st 6's.	1,000,000	..	..	..
Equitable, 1st 6's.	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	86	87
Consolidated G. & E. Co.'s. Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	..	89
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's	381,000	1,000	77	79
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	34	38
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	245	265
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	101	103
Indianapolis	2,000,000	..	80	90
" Bonds, 6's	2,650,000	..	103¾	104¼
Jackson Gas Co	250,000	50	73	75
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	98	98½x
Preferred	2,500,000	100	106	..
Bonds	10,000,000	1,000	109½	110
Lafayette Gas Co., Ind.	1,000,000	100		60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	130	140
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	107½	108¼
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	218	184¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co	6,000,000	..	56	58
Bonds, 6's	4,600,000	..	105	105¾
New Haven	1,000,000	25	300	325
Oakland, Cal.	2,000,000	..	46	47
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	102⅞	103
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	
Rochester Gas & Elec. Co..	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	41½	42½
St. Joseph Gas Co. " 1st Mtg. 5's	751,000	1,000	95	96¼
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's..	2,465,000	1,000	92	93
Syracuse, N. Y.	1,975,000	100	42	45
Bonds	2,047.000	1,000	99	100
Washington, D. C	2,600,000	20	410	415
First mortgage 6's	600,000	..	..	..
Western, Milwaukee. Bonds, 5's	4,000,000	..	109½	110
Wilmington, Del.	600,000	50	232	..

Advertisers' Index.

GAS ENGINEERS.

A. E. Boardman, Brevard, N. C. 352
Baxter & Young, Detroit, Mich. 352
David Leavitt Hough, New York City. 352
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 342
Frank D. Moses, Trenton, N. J. 339
Fred. Bredel Co., Milwaukee, Wis. 335
Geo. R. Rowland, New York City. 342
Humphreys & Glasgow, New York City. 353
Kerr Murray Mfg. Co., Fort Wayne, Ind. 352
The Gas Machinery Co., Cleveland, O. 339
The Jeffrey Manufacturing Co., Columbus, O. 349
The Western Gas Construction Co., Fort Wayne, Ind. 320
United Gas Improvement Co., Philadelphia, Pa. 347
Wm. Henry White, New York City. 355

GAS WORKS APPARATUS AND CONSTRUCTION.

A. E. Boardman, Brevard, N. C. 352
Bartlett, Hayward & Co., Baltimore, Md. 353
Baxter & Young, Detroit, Mich. 352
Christopher Cunningham, Brooklyn, N.Y. 349
Connelly Iron Sponge and Governor Co., New York City 303
Continental Iron Works, Brooklyn, N. Y. 354
Davis and Farnum Mfg. Co., Waltham, Mass. 342
Deily & Fowler, Philadelphia, Pa. 356
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 342
Frank D. Moses, Trenton, N. J. 339
Fred. Bredel Co,, Milwaukee, Wis. 335
G. Shepard Page's Sons, New York City. 352
Humphreys & Glasgow, New York City. 353
Isbell-Porter Company, New York City. 354
Kerr Murray Mfg. Co., Fort Wayne, Ind. 352
Lloyd Construction Co., Detroit, Mich. 342
Logan Iron Works, Brooklyn, N. Y. 356
Quintard Iron Works, New York City. 353
R. D. Wood & Co., Philadelphia, Pa. 354
Riter-Conley Mfg. Co., Pittsburg, Pa. 355
Stacey Mfg. Co., Cincinnati, O. 355
The Connersville Blower Company, Connersville, Ind. 357
The Gas Machinery Co., Cleveland, O. 339
The Jeffrey Manufacturing Co., Columbus, O. 349
The Western Gas Construction Co., Fort Wayne, Ind. 320
United Gas Improvement Co., Philadelphia, Pa. 347

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md. 323
B. E. Chollar, St. Louis, Mo. 342
Burdett Loomis, Hartford, Conn. 334
Economical Gas Apparatus Construct'n Co, Toronto, Ont. 342
Humphreys & Glasgow, New York City. 358
The Gas Machinery Co., Cleveland, O. 339
The Western Gas Construction Co., Fort Wayne, Ind. 320
United Gas Improvement Co., Philadelphia, Pa. 347

SCRUBBERS AND CONDENSERS.

Continental Iron Works, Brooklyn, N.Y. 354
Kerr Murray Mfg. Co., Fort Wayne, Ind. 352
Logan Iron Works, Brooklyn, N. Y. 356
R. D. Wood & Co., Philadelphia, Pa. 354
Riter-Conley Mfg. Co., Pittsburg, Pa. 355
The Gas Machinery Co., Cleveland, O. 339
The Western Gas Construction Co., Fort Wayne, Ind. 320

PRODUCER POWER PLANTS.

R. D. Wood & Co., Philadelphia, Pa. 354

TAR AND CARBONIC ACID EXTRACTOR.

The Gas Machinery Co., Cleveland, O. 339
The Western Gas Construction Co., Fort Wayne, Ind. 320

AMMONIA CONCENTRATORS.

Michigan Ammonia Works, Detroit, Mich. 340
The Gas Machinery Co., Cleveland, O. 339
The Western Gas Construction Co., Fort Wayne, Ind. 320

GAS METERS.

American Meter Co., New York and Philadelphia. 359
Detroit Meter Company, Detroit, Mich. 319
D. McDonald & Co., Albany, N.Y. 357
Helme & McIlhenny, Philadelphia, Pa. 359
John J. Griffin & Co., Philadelphia, Pa. 360
Keystone Meter Co., Royersford, Pa. 358
Maryland Meter and Mfg. Co., Baltimore, Md. 358
Metric Metal Co., Erie, Pa. 359
Nathaniel Tufts Meter Co., Boston, Mass. 358

PREPAYMENT METERS.

American Meter Co., New York and Philadelphia. 359
D. McDonald & Co., Albany, N. Y. 357
Helme & McIlhenny, Philadelphia, Pa. 359
John J. Griffin & Co., Philadelphia, Pa. 360
Keystone Meter Co., Royersford, Pa. 358
Nathaniel Tufts Meter Co., Boston, Mass. 358

PREPAYMENT METER ATTACHMENTS.

Reeves Mfg. Co., New Haven, Conn. 340

GAS AND WATER PIPES.

Christopher Cunningham, Brooklyn, N.Y. 349
Donaldson Iron Co., Emaus, Pa. 344
M. J. Drummond & Co., New York City. 344
R. D. Wood & Co., Philadelphia, Pa. 344
Warren Foundry and Machine Co., New York City. 344

GAS MAIN STOPPERS.

Safety Gas Main Stopper Co., N.Y. City. 344

GAS TAPPING MACHINES.

George Light, Dayton, O. 344
H. Mueller Manufacturing Company, Decatur, Ills. 341

GAS COALS.

Berwind-White Coal Mining Co., New York and Phila. 350
Perkins & Co., New York City. 350
Westmoreland Coal Co., Philadelphia, Pa. 351

CANNEL COALS.

Perkins & Co., New York City. 350

AUTOMATIC WEIGHING M CHINERY.
Richardson Scale Co., New York City..... 340

CONVEYORS.
Akron Cultivator Co., Akron, O..... 340
C. W. Hunt Company, New York City..... 341
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 352
The Gas Machinery Co., Cleveland, O..... 339
The Jeffrey Manufacturing Co., Columbus, O..... 349
The Link-Belt Machinery Co., Chicago, Ills..... 351
The Western Gas Construction Co., Fort Wayne, Ind... 320

CHARGING BARROWS & COAL WAGONS.
Akron Cultivator Co., Akron, O..... 340
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 352

GAS ENRICHERS.
Gulf Refining Co., Pittsburg, Pa..... 350
Standard Oil Co., New York City..... 351
The Sun Oil Co., Pittsburg, Pa..... 351

COKE CRUSHERS.
C. M. Keller, Columbus, Ind..... 351
The Jeffrey Manufacturing Co., Columbus, O..... 349

STEAM BLOWER FOR BURNING BREEZE.
H. E. Parson, Brooklyn, N. Y..... 344
The Connersville Blower Company, Connersville, Ind... 357

ECONOMIZERS.
Green Fuel Economizer Co., Matteawan, N.Y..... 342

GAS GAUGES.
The Bristol Co., Waterbury, Conn..... 349

GAS GOVERNORS.
Connelly Iron Sponge and Governor Co., New York City 303
Isbell-Porter Co., New York City..... 351
R. D. Wood & Co., Philadelphia, Pa..... 354

CEMENTS.
C. L. Gerould, Galesburg, Ills..... 348

RETORTS AND FIREBRICKS.
Adam Weber Sons, New York City..... 348
Baltimore Retort and Firebrick Co., Baltimore, Md..... 348
Brooklyn Firebrick Works, Brooklyn, N. Y..... 348
Cyrus Borgner, Philadelphia, Pa..... 348
Henry Maurer & Son, New York City..... 348
James Gardner, Jr., Co., Pittsburg, Pa..... 348
J. H. Gautier & Co., Jersey City, N. J..... 348
Laclede Firebrick Mfg. Co., St. Louis, Mo..... 348
Missouri Firebrick Co., St. Louis, Mo..... 348
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 3.6
The Kreischer Brick Mfg. Co , New York City..... 385

INCLINED RETORTS.
Adam Weber Sons (Graham, Morton [England] System) 338

VERTICAL S'S.
Adam Weber Sons (Oscar B. Weber's Construction)..... 348

REGENERATIVE FURNACES.
Adam Weber Sons, New York City..... 348
Bartlett, Hayward & Co., Baltimore, Md..... 353
Fred. Bredel, Milwaukee, Wis..... 335
J. H. Gautier & Co., Jersey City, N.J..... 348
Laclede Firebrick Mfg. Co., St. Louis, Mo..... 348
Missouri Firebrick Co., St. Louis, Mo..... 348
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 348

SELF-SEALING MOUTHPIECE DOORS.
Continental Iron Works, Brooklyn, N.Y..... 354
Isbell-Porter Co., New York City..... 354
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 352
Logan Iron Works, Brooklyn, N.Y..... 356
R. D. Wood & Co., Philadelphia, Pa..... 354
The Gas Machinery Co., Cleveland, O..... 339
The Western Gas Construction Co., Fort Wayne, Ind... 320

CHIMNEY CONSTRUCTION.
Adam Weber Sons, New York City..... 348

INCANDESCENT GAS LAMPS.
Ball Check Light Co., New York City..... 339
Detroit Arc Gas Light Co., Detroit, Mich..... 340
D. M. Steward Mfg. Co., Chattanooga, Tenn..... 340
General Gas Light Company, Kalamazoo, Mich..... 337
Welsbach Company, Gloucester, N. J..... 346

BURNERS.
C A. Gefrorer, Philadelphia, Pa..... 340
D M. Steward Mfg. Co., Chattanooga, Tenn..... 340
Sunlight Lava Mfg. Co., Chattanooga, Tenn..... 340
Wm. M. Crane Co., New York City..... 341

LAVA GAS TIPS.
D. M. Steward Mfg. Co., Chattanooga, Tenn..... 340
Sunlight Lava Mfg. Co., Chattanooga, Tenn..... 340

STREET LAMPS.
Thos. T. W. Miner, New York City..... 341
Welsbach Street Lighting Co., New York and Phila.... 346

PURIFIERS.
Kerr Murray Mfg. Co., Fort Wayne, Ind. 352
R. D. Wood & Co., Philadelphia, Pa..... 354
Stacey Mfg. Co., Cincinnati, O..... 355
The Western Gas Construction Co., Fort Wayne, Ind... 320

PURIFYING MATERIALS.
Connelly Iron Sponge and Governor Co., New York City 303

VALVES.
Continental Iron Works, Brooklyn, N. Y..... 354
Isbell-Porter Co., NewYork City..... 354
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 352
Ludlow Valve Manufacturing Co., Troy, N.Y..... 341
R. D. Wood & Co., Philadelphia, Pa..... 354
The P. H. & F. M. Roots Co., Connersville, Ind..... 343
The Western Gas Construction Co., FortWayne, Ind.... 320

EXHAUSTERS.
Connelly Iron Sponge and Governor Co., New York City 303
Isbell-Porter Company, New York City..... 354
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 352
The Connersville Blower Company, Connersville, Ind... 353
The P. H. & F. M. Roots Co., Connersville, Ind..... 343

ELECTRICAL APPARATUS.
Wm. Henry White, New York City..... 355

PURIFIER SCREENS.
John Cabot, New York City..... 349

GAS STOVES.
American Meter Co., New York and Philadelphia..... 345
Keystone Meter Co., Royersford, Pa..... 358
Maryland Meter and Manufacturing Co., Baltimore, Md 358
Nathaniel Tufts Meter Co., Boston Mass..... 358

HOT WATER HEATERS.
The Humphrey Mfg. and Plating Co., Kalamazoo, Mich. 344

GASHOLDER TANKS.
J. P. Whittier, Brooklyn, N.Y..... 342

GASHOLDERS.
Bartlett, Hayward & Co., Baltimore, Md..... 355
Continental Iron Works, Brooklyn, N.Y..... 354
Davis & Farnum Mfg. Co., Waltham, Mass..... 352
Deily & Fowler, Philadelphia, Pa..... 326
Kerr Murray Mfg. Co., FortWayne, Ind..... 352
Logan Iron Works, Brooklyn, N Y..... 356
R. D. Wood & Co., Philadelphia, Pa..... 354
Riter-Conley Mfg. Co., Pittsburg, Pa..... 355
Stacey Mfg. Co., Cincinnati, O..... 355

STORAGE TANKS.
Christopher Cunningham, Brooklyn, N.Y..... 349

AUTOMATIC SCALES.
Richardson Scale Co., New York City..... 340

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W. R. Faben Construction Company, Toledo, O..... 340

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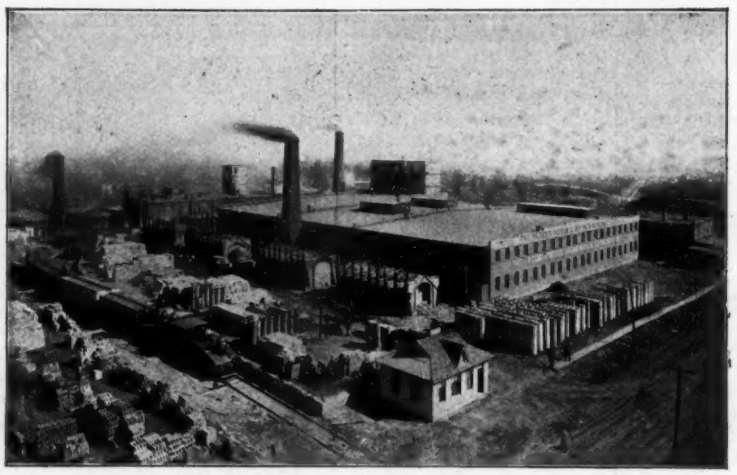

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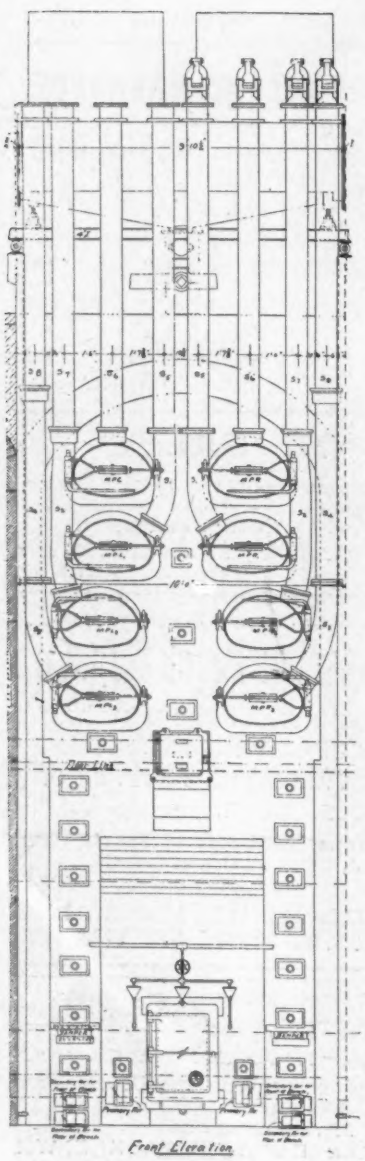

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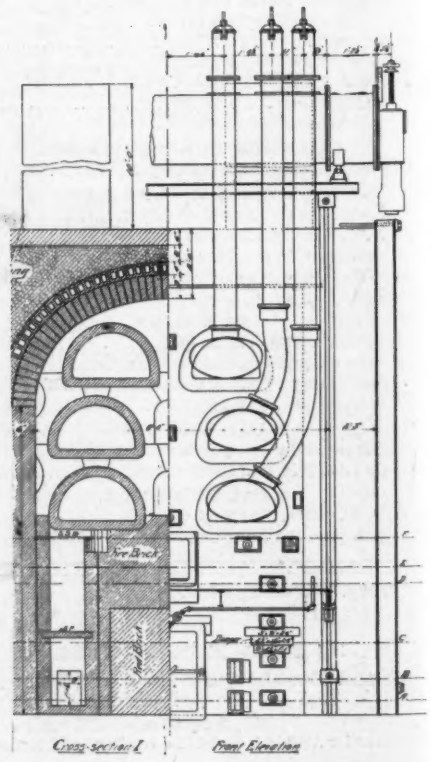

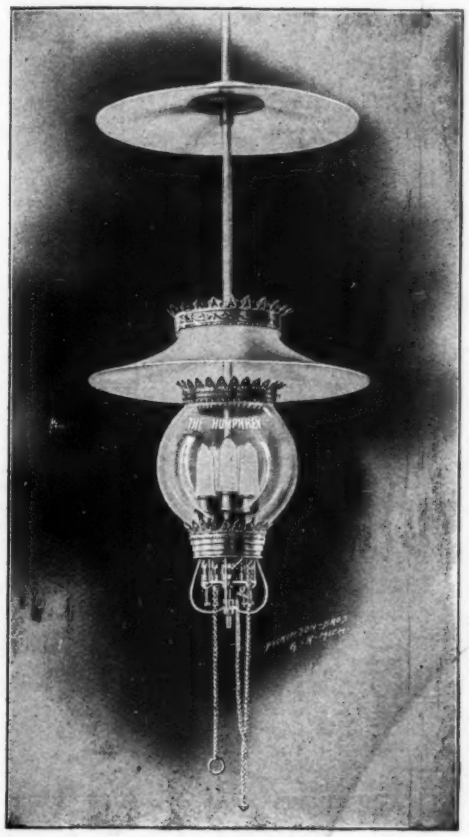

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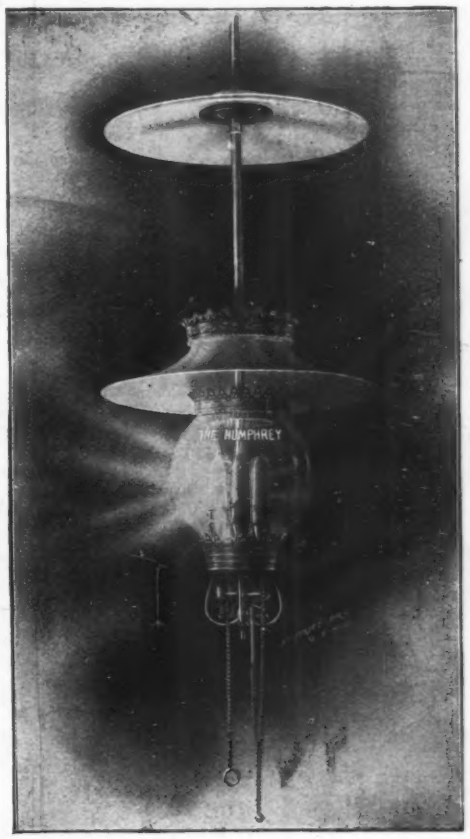

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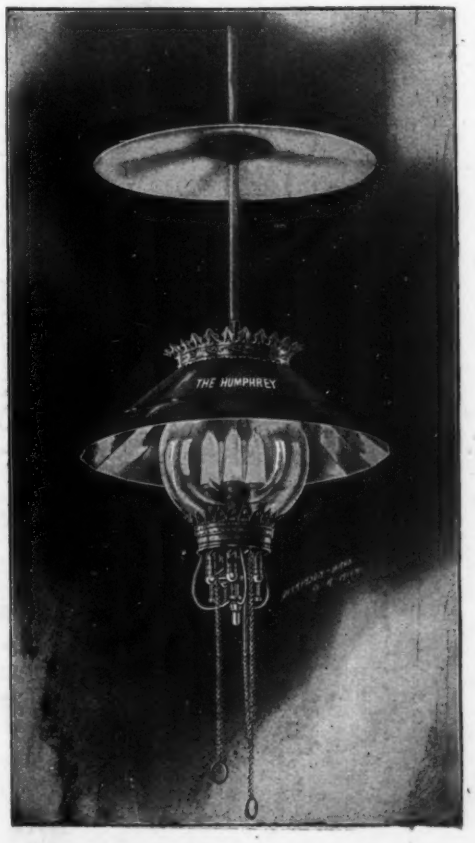

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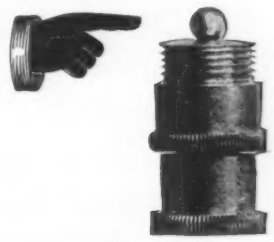

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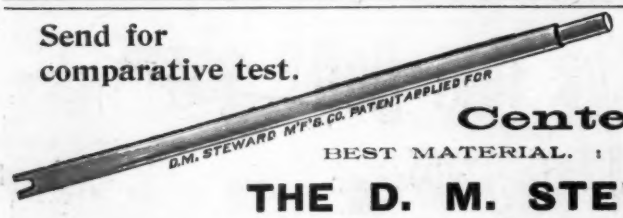

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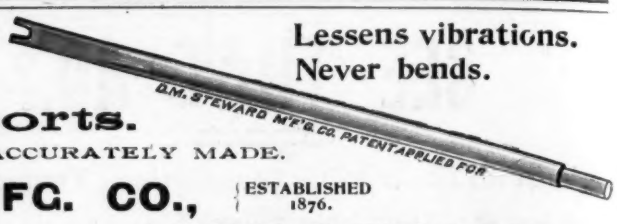

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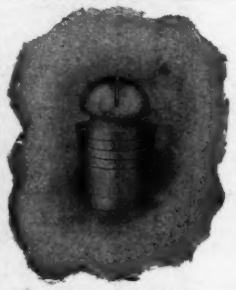

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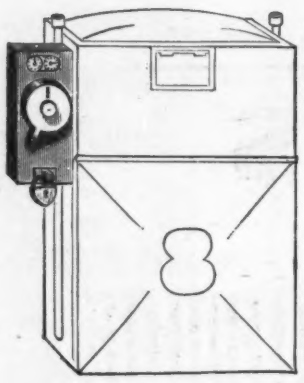

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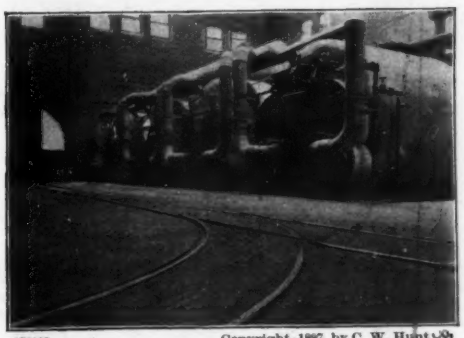

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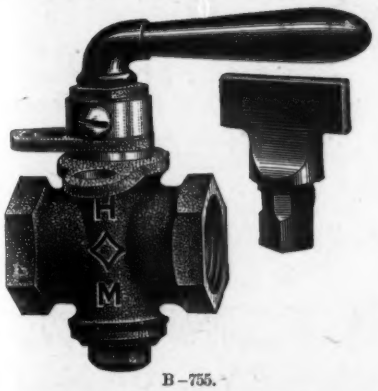

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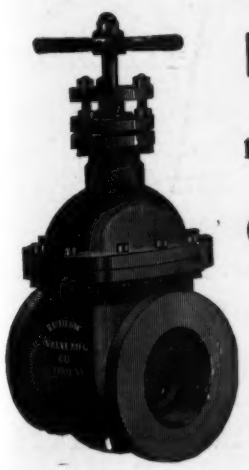

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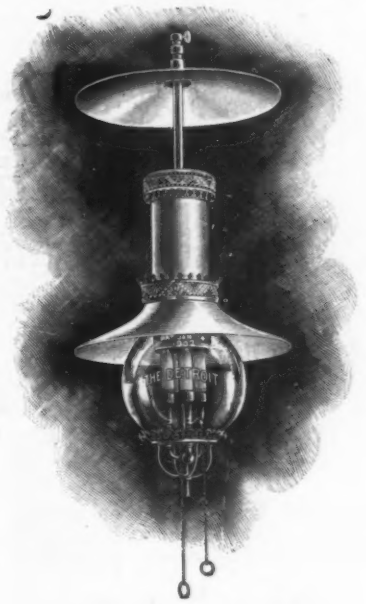

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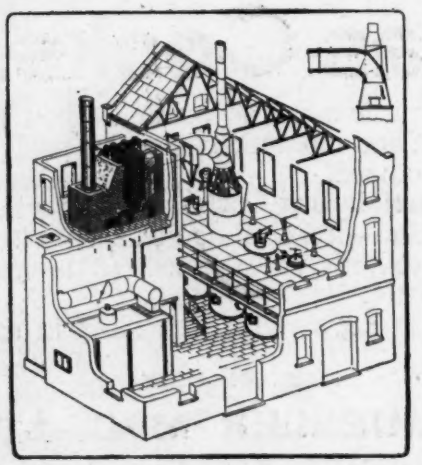

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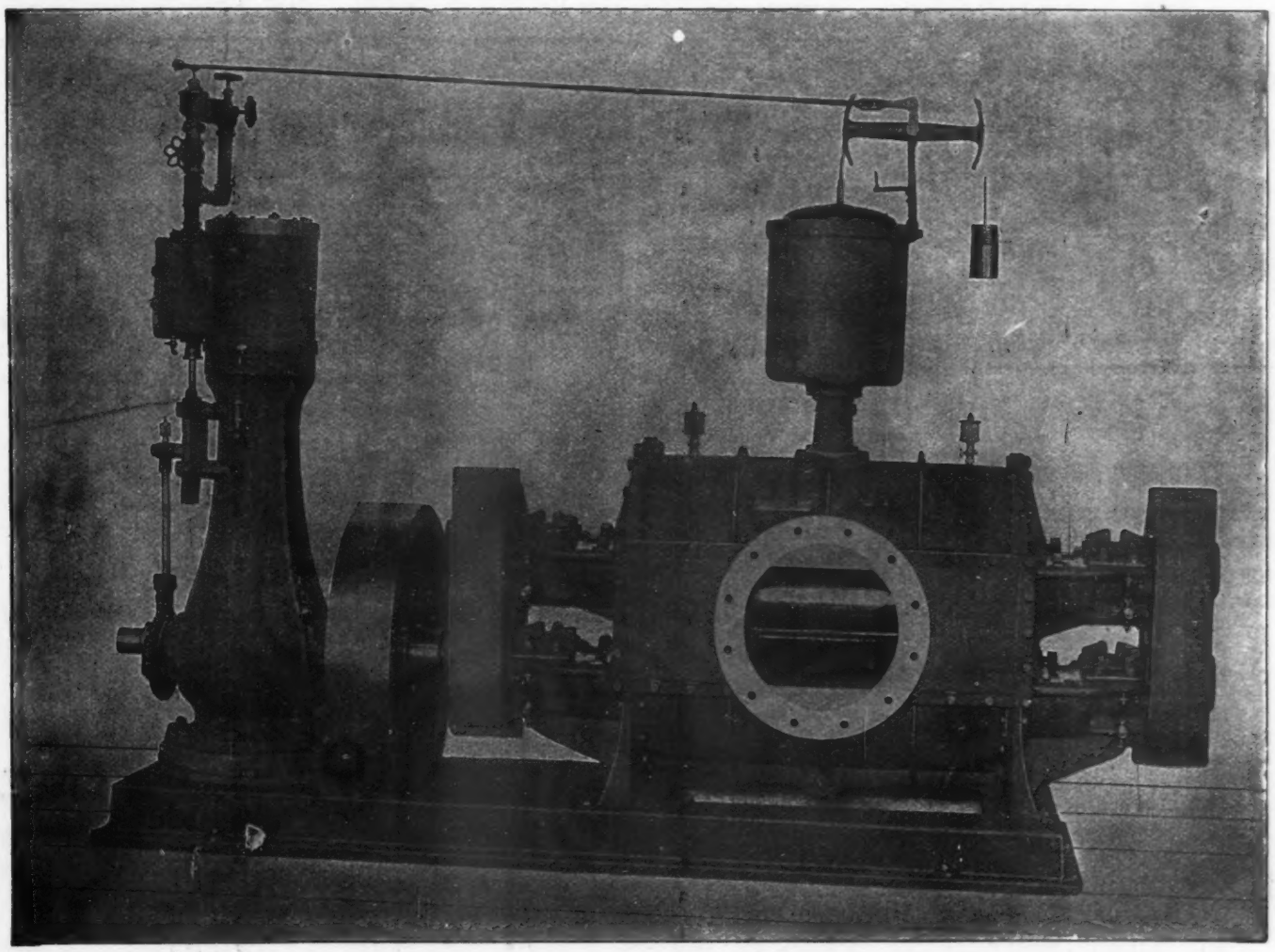

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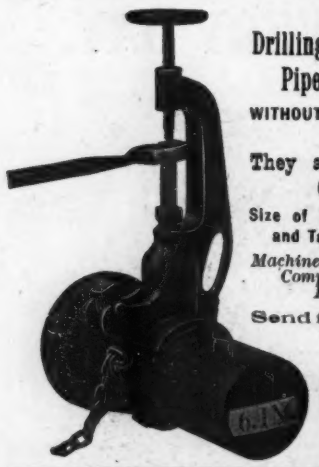

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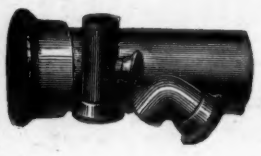

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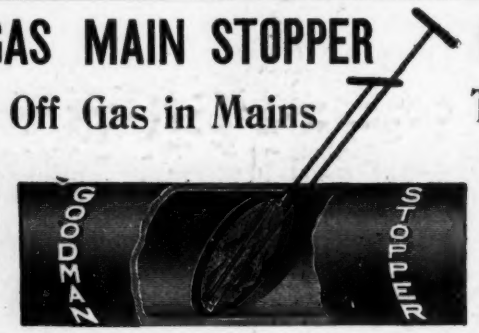

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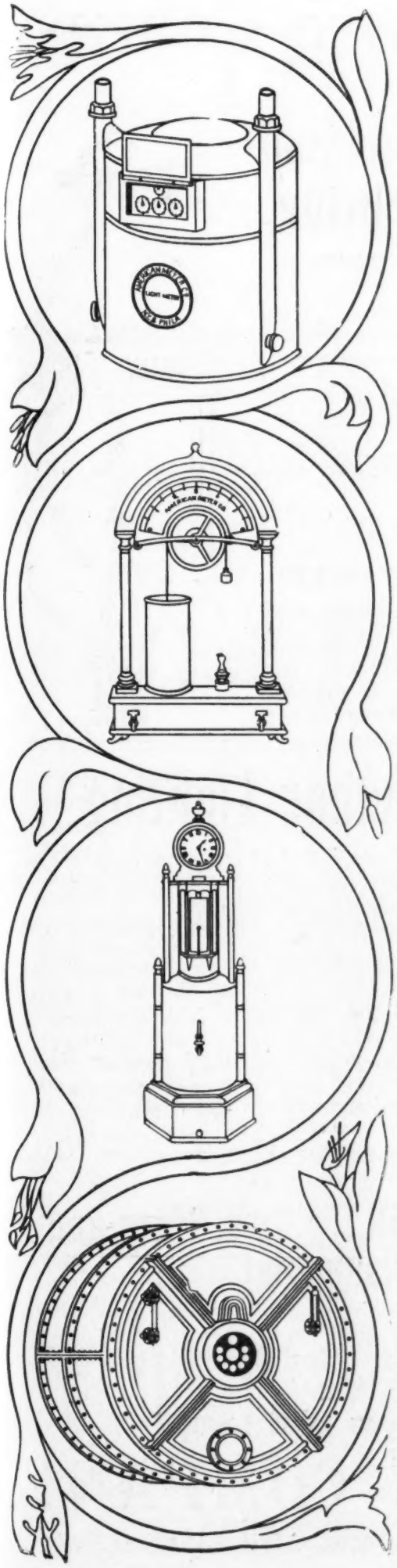

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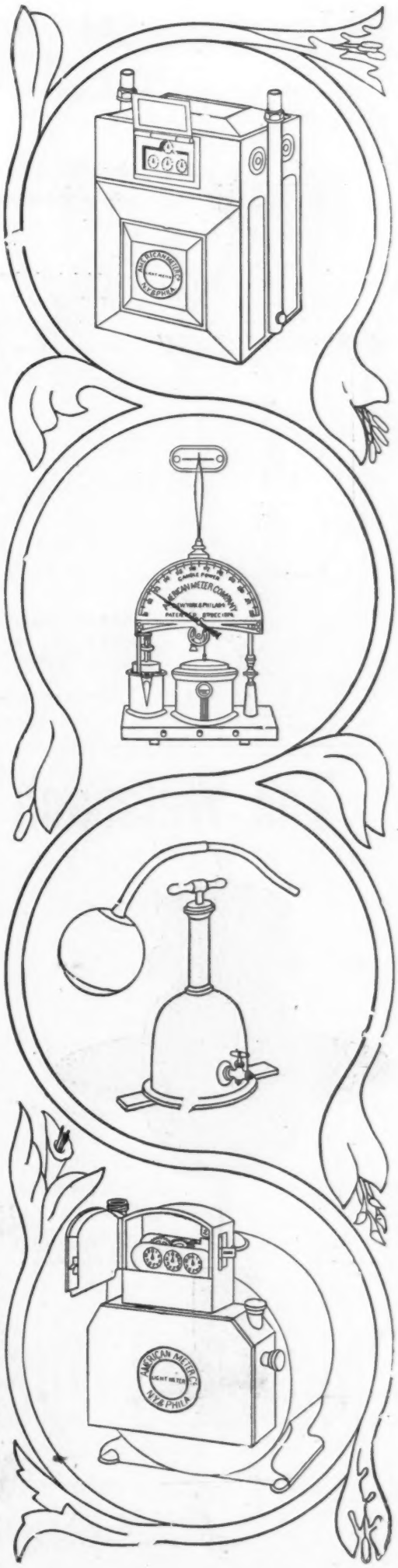
PUBLIC LIGHTING TABLE.

MARCH, 1903.

Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Sun.	1	6.20 PM	5.30 AM	5.30	5.45
Mon.	2	6.20	5.30	5.30	5.45
Tue.	3	9.30	5.30	5.30	5.45
Wed.	4	10.30	5.30	5.30	5.45
Thu.	5	11.30	5.30	5.40	5.35
Fri.	6	12.30 AM FQ	5.30	5.40	5.35
Sat.	7	1.30	5.30	5.40	5.35
Sun.	8	2.20	5.20	5.40	5.35
Mon.	9	3.10	5.20	5.40	5.35
Tue.	10	3.50	5.20	5.40	5.35
Wed.	11	No L.	No L.	5.40	5.35
Thu.	12	No L. FM	No L.	5.50	5.20
Fri.	13	No L.	No L.	5.50	5.20
Sat.	14	6.40 PM	8.40 PM	5.50	5.20
Sun.	15	6.40	9.40	5.50	5.20
Mon.	16	6.40	10.40	5.50	5.20
Tue.	17	6.40	11.40	5.50	5.20
Wed.	18	6.40	12.40 AM	5.50	5.20
Thu.	19	6.40	1.30	6.00	5.10
Fri.	20	6.40 LQ	2.20	6.00	5.10
Sat.	21	6.40	3.00	6.00	5.10
Sun.	22	6.50	3.40	6.00	5.10
Mon.	23	6.50	4.20	6.00	5.10
Tue.	24	6.50	5.00	6.00	5.10
Wed.	25	6.50	5.00	6.00	5.10
Thu.	26	6.50	5.00	6.10	4.55
Fri.	27	6.50	5.00	6.10	4.55
Sat.	28	6.50 NM	5.00	6.10	4.55
Sun.	29	6.50	4.50	6.10	4.55
Mon.	30	6.50	4.50	6.10	4.55
Tue.	31	6.50	4.50	6.10	4.55

TOTAL HOURS LIGHTING DURING 1903.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	245.00	January	423.20
February	192.00	February	355.25
March	201.00	March	355.35
April	167.20	April	298.50
May	152.00	May	264.50
June	131.00	June	234.25
July	140.40	July	243.45
August	156.20	August	280.25
September	171.20	September	321.15
October	198.20	October	374.30
November	216.30	November	401.40
December	232.10	December	433.45
Total, yr.	2203.40	Total, yr.	3987.45



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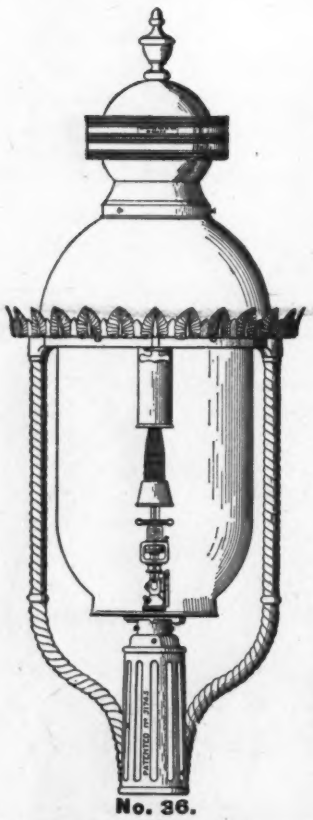
.... OF AMERICA ....



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2. The renewal of mantles and the cleaning of globes without removal of globe.
3. The greatest amount of candle power with least consumption of gas.
4. A by-pass cock so constructed as to permit all or only one mantle burning at a time.
5. A pilot light that consumes but 1 foot of gas in 24 hours. Costs $\frac{1}{10}$ of a cent a day.

Give it a Chance to Tell its Own Story and it Won't Disappoint.

Let us send you one lamp—doesn't cost a fortune—and it will answer every question you put to it; make good on every test given it. You know the only proof of the pudding? What's the use in a fellow telling you it tastes good? Taste it yourself, then you know.

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Blue Island, Ills.	Jersey City, N. J.	Oneonta, N. Y.
Boonton, N. J.	Laconia, N. H.	Plainfield, N. J.
Brooklyn, N. Y.	Lakewood, N. J.	Portland, Me.
Carlisle, Pa.	La-Salle-Peru, Ills.	Pottsville, Pa.
Champaign, Ills.	Martinsville, Ind.	Scranton, Pa.
Coney Island, N. Y.	Memphis, Tenn.	South Brooklyn, N. Y.
Dallas, Tex.	Newark, N. J.	Suffern, N. Y.
Danville, Ills.	New Brunswick, N. J.	Swedesboro, N. J.
Des Moines, Ia.	New London, Conn.	Syracuse, N. Y.
Evanston, Ills.	New Orleans, La.	Washington, N. C.
Evansville, Ind.	Norfolk, Va.	Woonsocket, R. I.

TOTAL SETS, 1902, ... 51
TOTAL DAILY CAPACITY, 1902, . . 32,825,000 cubic feet.
TOTAL SETS TO DATE, ... 447
TOTAL DAILY CAPACITY, ... 299,670,000 cubic feet.

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Established 1858. Incorporated 1890.
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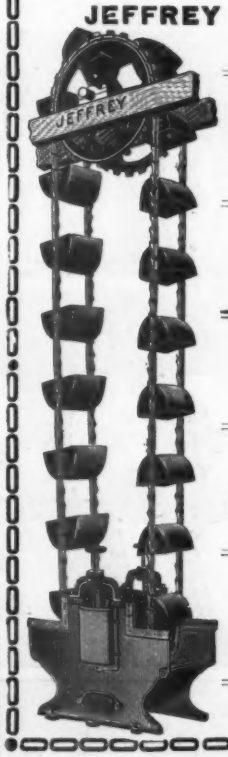

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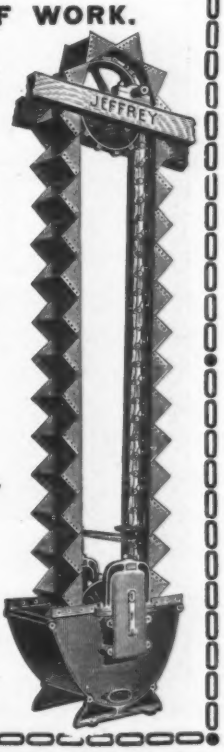

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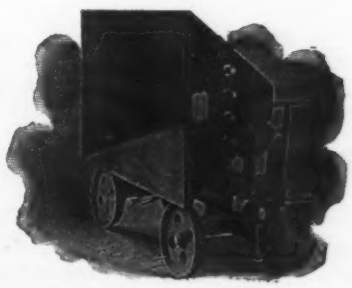

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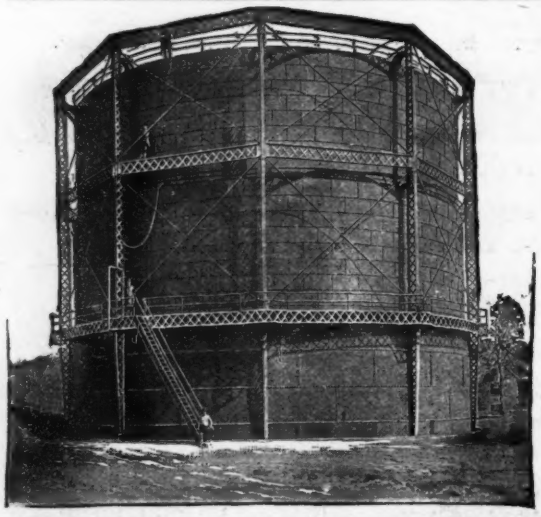

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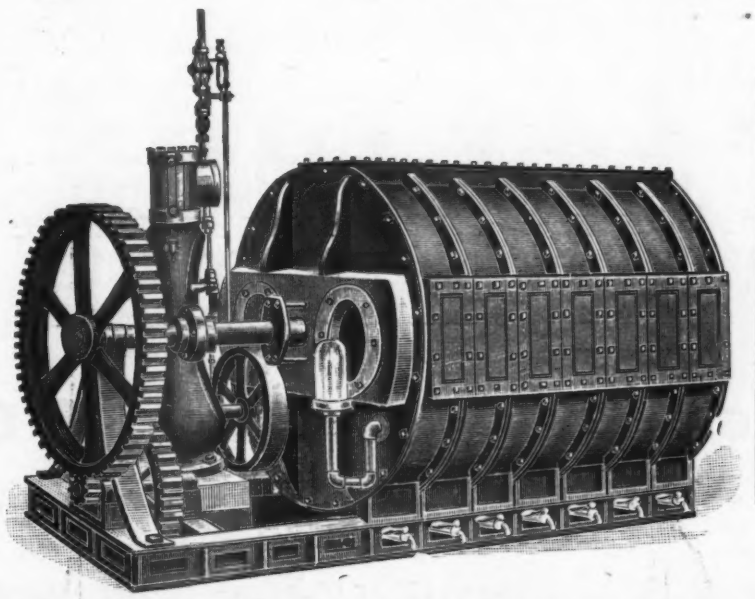

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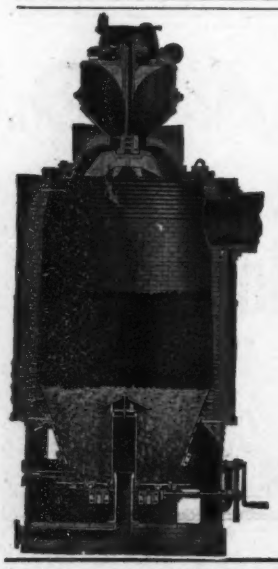

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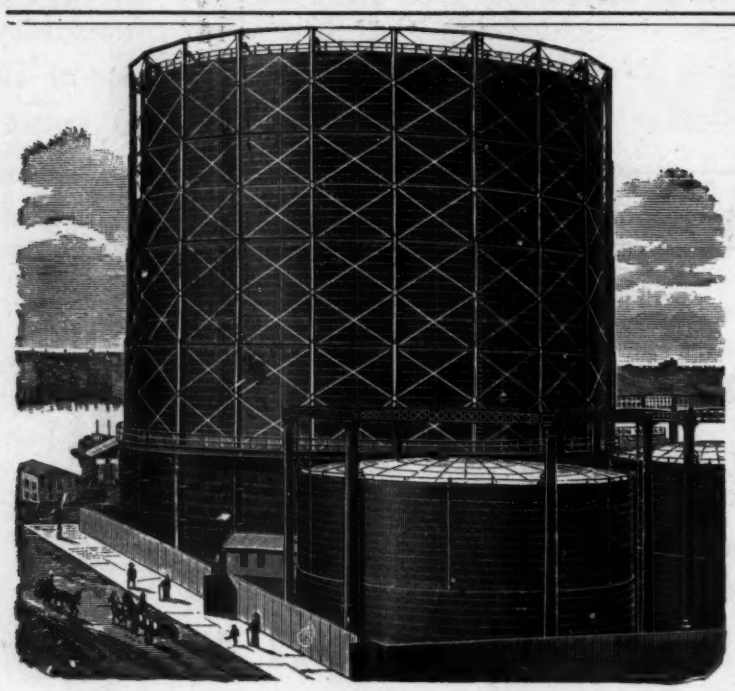

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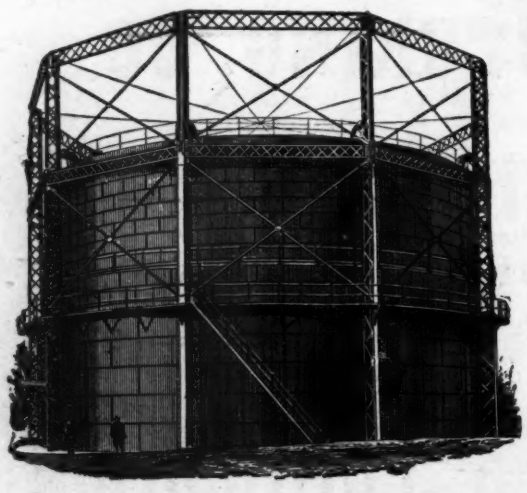

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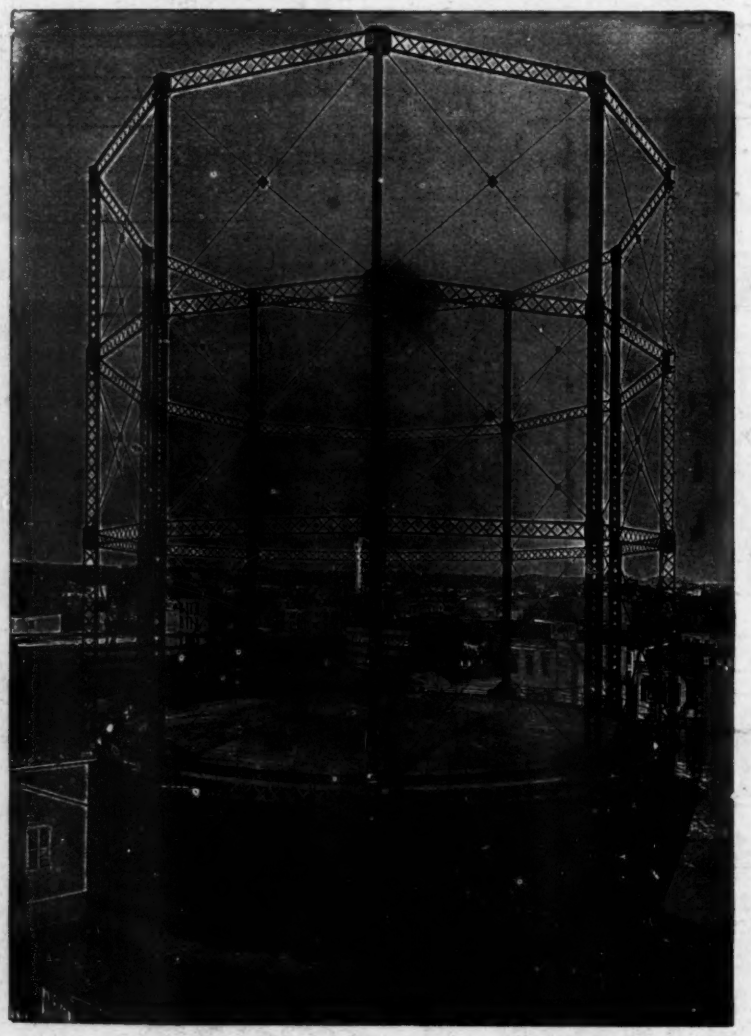

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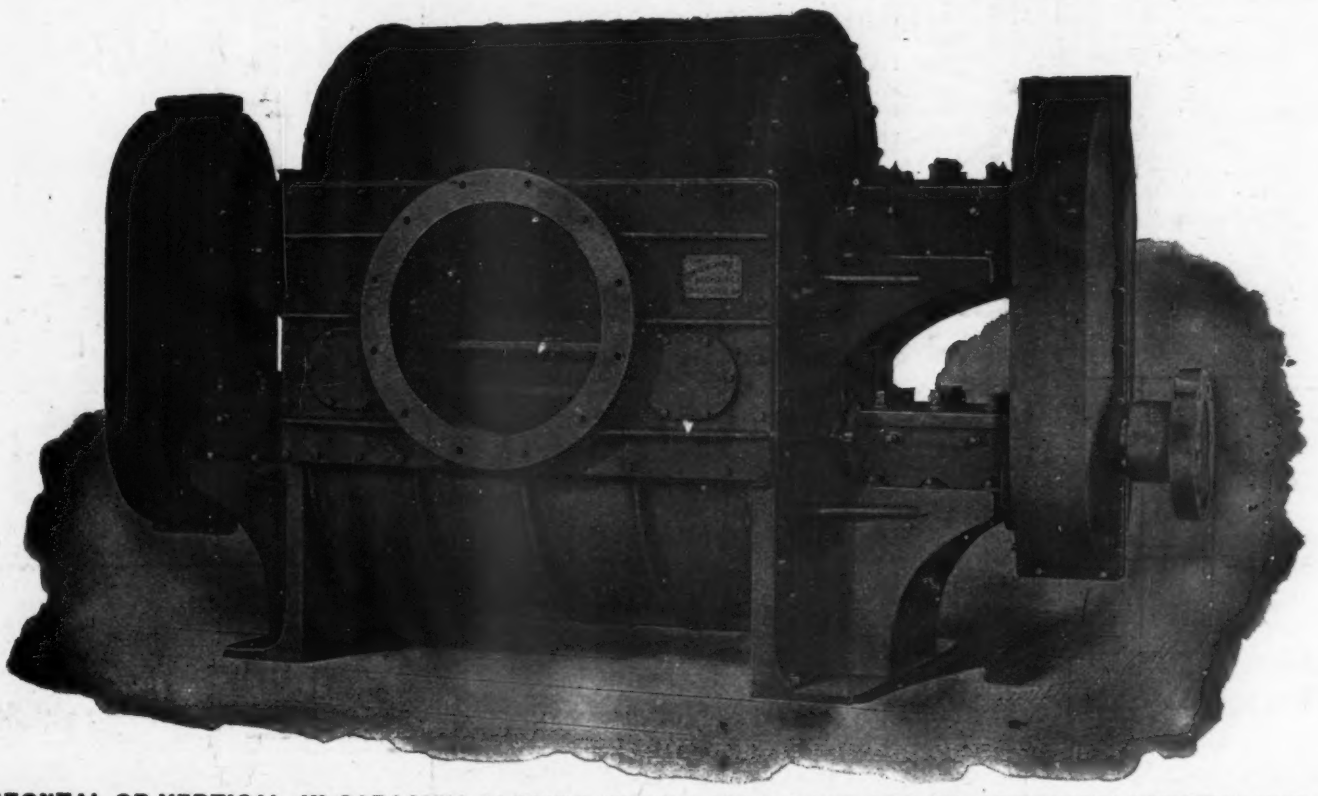

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